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FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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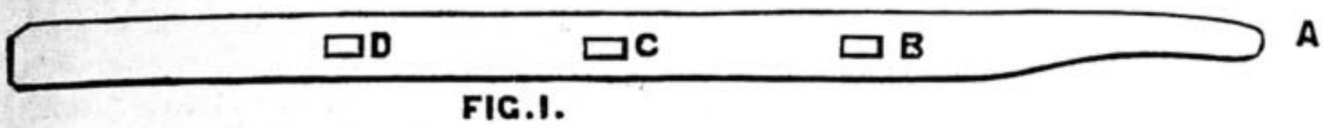

FIG.1.

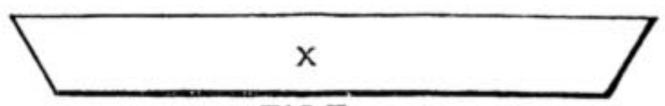

FIG.7.

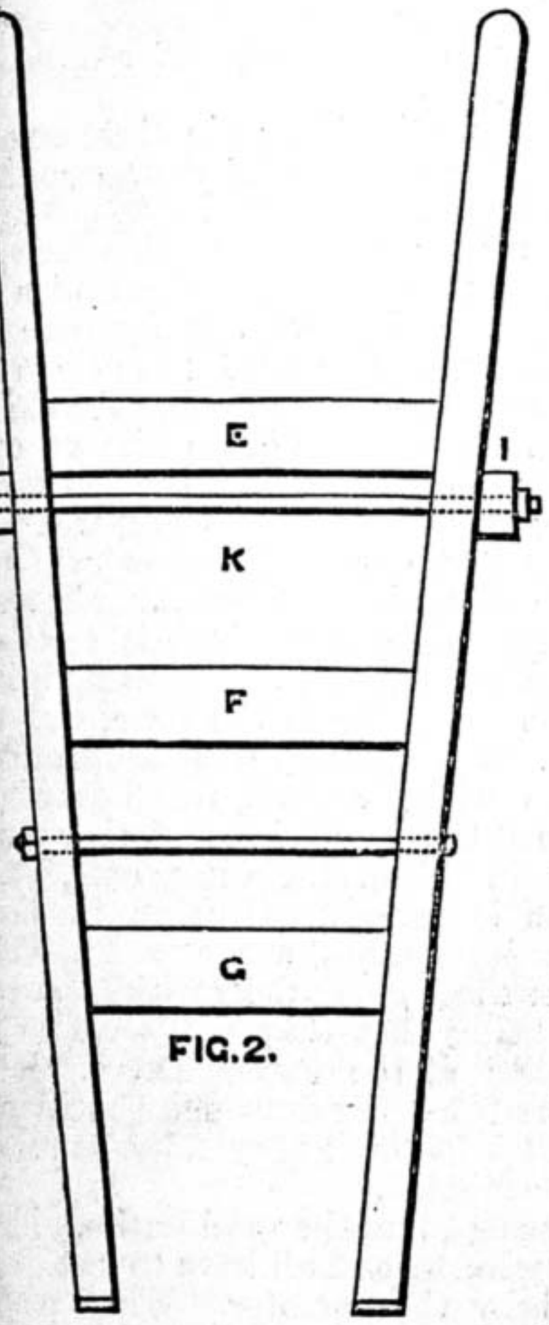

FIG.2.

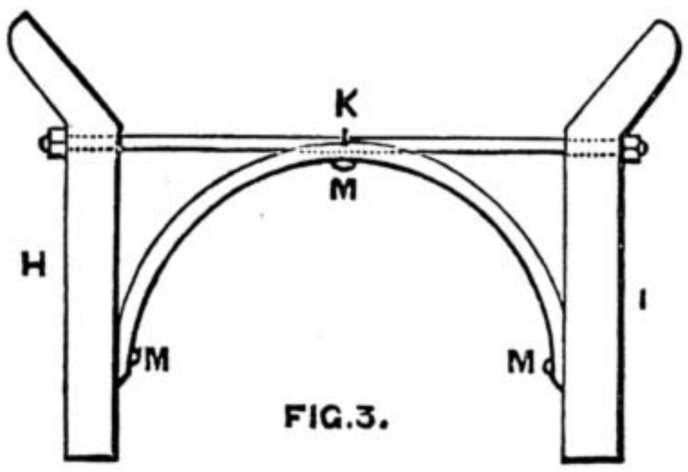

FIG.3.

FIG.5.

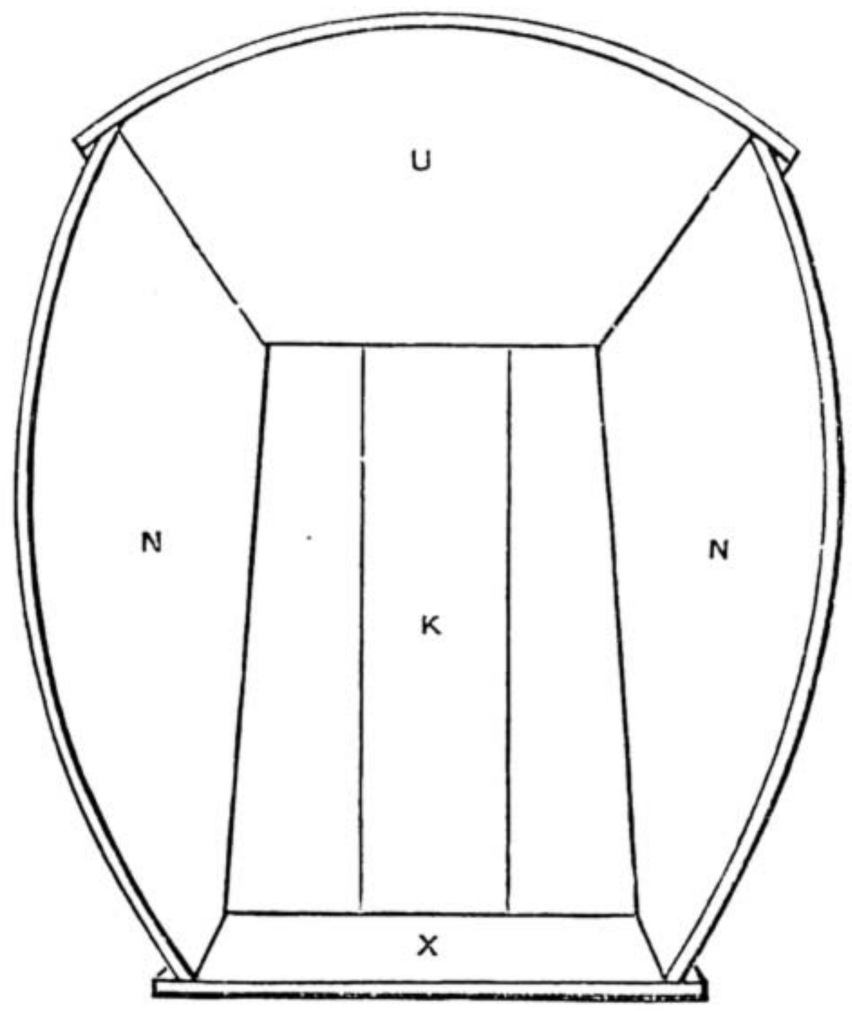

FIG.8.

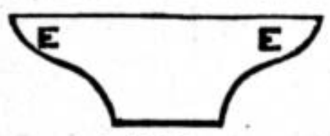

FIG.4.

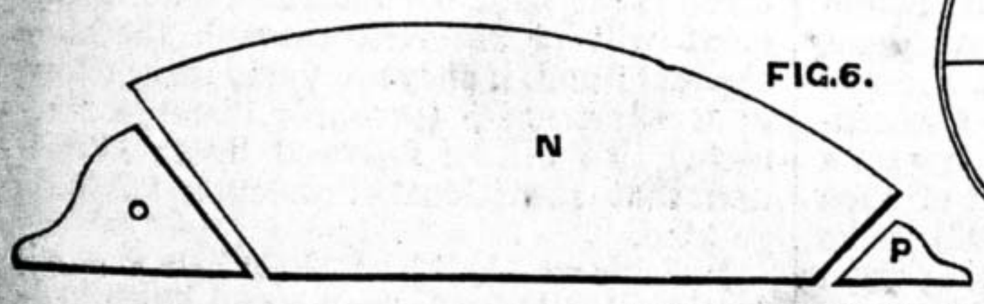

FIG.6.

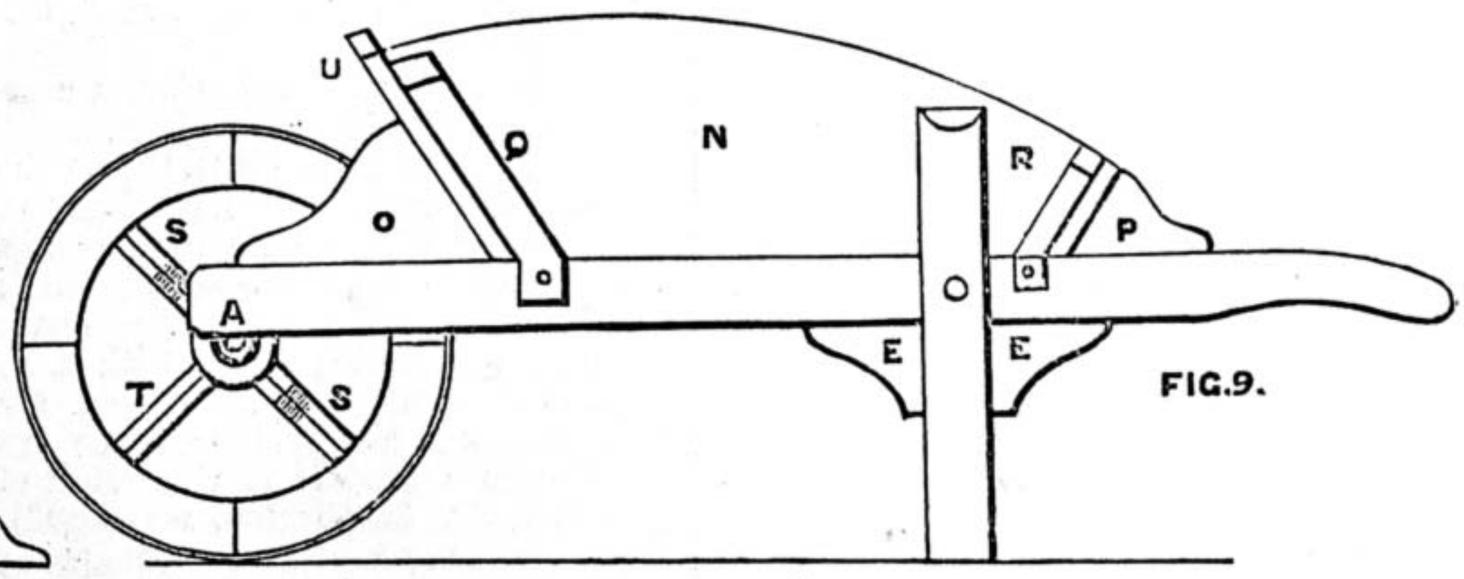

FIG.9.

Taking out a Patent: Example of Drawings to Illustrate Specification.

TAKING OUT A PATENT.

BY C. C. C.

PATENTS AND PATENT AGENTS—THE LAW OF PATENTS, THEIR ORIGIN AND OBJECTS—WHAT MAY BE PATENTED—HOW TO GET A PATENT AT LEAST COST—OBTAINING PROVISIONAL PROTECTION—NECESSARY FORMS, THEIR COST—FILLING UP FORMS AND MAKING DRAWINGS—EXAMPLE OF A SPECIFICATION—RIGHTS UNDER PROVISIONAL PROTECTION—COMPLETING THE PATENT—FORMS FOR THIS, AND THEIR COST—MAKING COMPLETE SPECIFICATION—EXPENSE OF A PATENT.

"How can I get a patent?" "What would a patent cost?" and "What would be the most ready and economical way of setting about getting a patent?" are questions certain to occur at some time or other to those of an inventive turn. The columns of "Shop" show that they exercise the minds of various of the readers of WORK. The writer, who has had some years' experience as an unprofessional patent agent, is in a position to answer these questions, and somewhat more at length than it might be found possible to do in the above-mentioned columns. He can also, if desired, say a word or two about the registration of designs and trade marks.

It is well that all those who invent should have this information. Many an idea of practical value is allowed to remain undeveloped, or it is developed and its fruits enjoyed by others than its originator, solely through the apparent difficulty of securing patent rights. Inventors ignorant on these points are scared by the vague fears of expense, or they may not find it easy to consult a patent agent, since these gentlemen are to be found in large towns only. Many inventors, mechanics by calling especially, have a not unreasonable dread of the charges of professional men. And though it is but just to admit that patent agents are as a class very quick in catching the ideas of their clients, there are few among working people who can explain themselves to a strange gentleman as they

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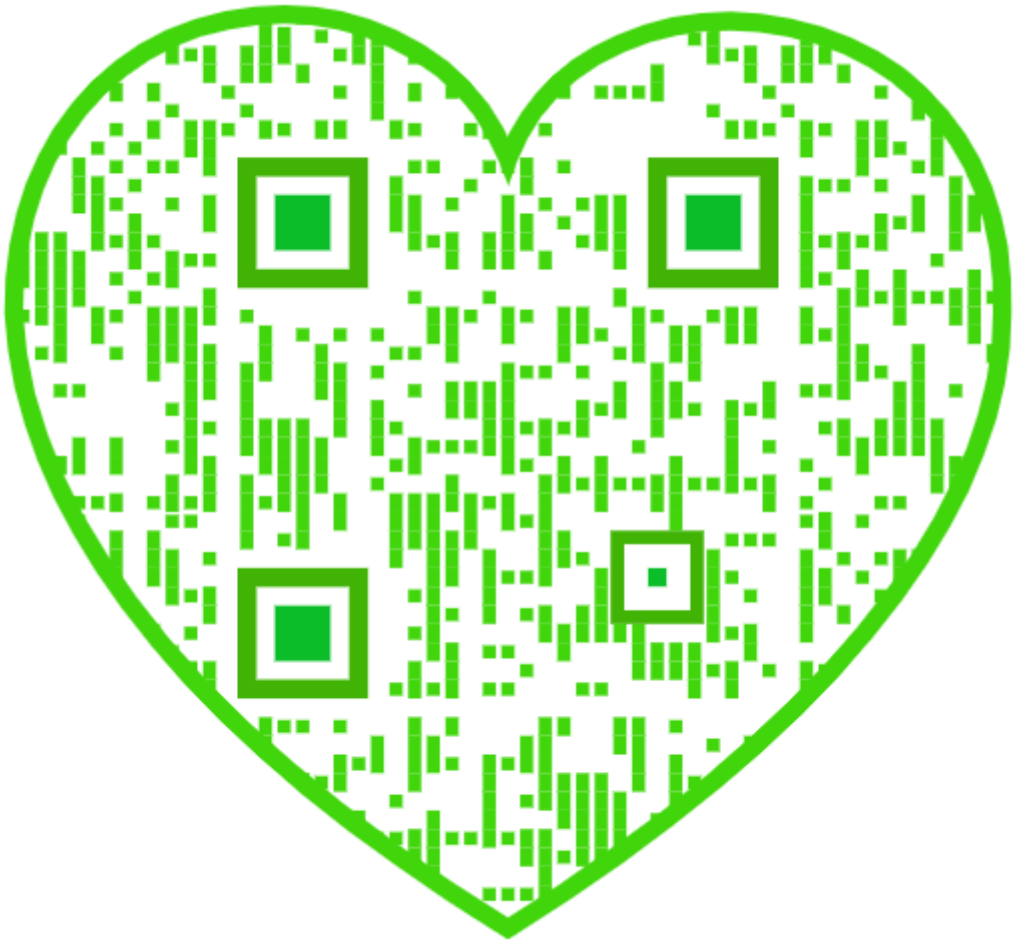

could whilst chatting with a friend, or sitting quietly jotting down their ideas at leisure on a sheet of paper.

These considerations being borne in mind, it is proposed in the present article to show how any inventor who can express himself intelligibly in pen and ink, and can make a mechanical drawing, or who has a friend who can help him in either or both ways, may get his patent without the intervention of an "acknowledged agent," and secure his rights without running into any unnecessary or unknown expenditure.

In the energetic little manufacturing town in which the writer resides, inventors among working men are numerous, and he has become an "unacknowledged patent agent" involuntarily. His neighbours have fallen into a way of coming to him with their inventions, not only because he was close at hand and they were not afraid of his fees, but also because, knowing him, they could explain matters freely to him. The "unacknowledged" patent agent will, however, soon be a thing of the past, for a clause comes into force in the present year (1889) which subjects any unlicensed person practising as a patent agent to a penalty of £20, though this by no means affects the right of any inventor to act for himself in procuring a patent. Whilst, however, the writer acted in the capacity of agent, none of his work as such has failed, and he believes he has been successful chiefly because in his specifications and drawings he has kept in view the primary and fundamental objects of the patent laws.

What these are we shall see if we just glance at the origin of patents, as we understand that term in common parlance.

Their history begins in the reign of James I. Before that time the inventor had no protection except by keeping his own counsel. Shrewd men protected themselves in this way, and the consequence was that when they died many trade secrets of more or less value were lost to the community.

This was acknowledged to be an evil, and as a remedy it was enacted in the 21st year of James I., c. III., that if any useful secret were fully described and the description placed on record, its inventor should, upon payment of certain somewhat heavy fees, be guaranteed the sole right to use or sell his invention, during a reasonable time, throughout the king's dominions.

Previous to the year 1624, in which the above Act was passed, the practice of granting monopolies had prevailed in this country. Persons with sufficient influence had been accustomed to obtain for themselves an exclusive right to trade with certain countries, to import certain articles of consumption, or to practise certain crafts. This practice was justly regarded as a grievance by the public at large, though, as it was a source of no small profit to the Government, it was defended by the party of prerogative. It was, however, abolished by the Patent Act, and the system of protecting inventions established in its stead.

But this more equitable arrangement was not without its opponents. It was urged that a patent, during the time that it remained in force, deprived other inventors of their inherent right of making the same discovery for themselves—that the new law was opposed to the law of Nature, by which the way of improvement is alike open to all, and more to the same purpose. Nevertheless, the principle held its ground. The system was initiated by England; after a long interval (in 1790) France followed her example; and since that time the plan has been generally adopted among civilised nations.

It will be seen from the above that the prime object for which Patent Laws were instituted was not the protection of the individual, but the preservation of such inventions as might be of practical benefit to the public, and that the condition on which they offer protection is the complete divulgence of the inventor's secret. The one thing, therefore, that is needful in drawing up a satisfactory specification is *that it shall be plain*, nor is there any statutory form to be adhered to beyond that on the paper furnished to the applicant for filling up.

"What may or may not be patented?" is a question to be asked at the outset. It would appear that nothing has a claim to protection under the patent laws which is not the outcome of thought. No mere natural product is a subject for a patent; but evolve the idea of mixing two or more products, so as to form a new and useful compound, and you have a proper subject. A single metal, as such, cannot be patented, but a combination of metals, as *Muntz's Metal*, is entitled to protection. In a general way it may be said that anything is patentable which can be described as a new and useful art, manufacture, machine, apparatus, or article; any improvement in any of these; or any new composition of substances in such a manner as to be useful. By the statute of James I., manufactures brought from over seas, though old in other countries, may claim protection if new to Britain. But nothing may be patented which is dangerous, mischievous, or inconvenient to the public—nothing which is hurtful to trade or to the public morals. Patents for improvements in patented machines or apparatus are allowable; but if the improvements cannot be made use of apart from the patent machine, the expiration of the first patent must be waited for, unless the two patentees can come to a private arrangement. Finally, the invention must not only be new, but it must presumably be useful and beneficial to the public; a novel curiosity, as such, being no subject for a patent.

Let it be supposed that we are in possession of a patentable idea, and that it is desirable for us to protect it on the most economical terms. We have first to decide on the most fitting title for our idea, and whether we are to speak of it as an "invention" or an "improvement." That done, we may quietly sit down with a sheet of paper before us, and as simply, straightforwardly, and clearly as we can, draw up a description of it. If it will admit of such aids to verbal description, we should make rough drawings as we go on, marking them and our manuscript with letters so as to render reference easy.

While thus engaged we should bear in mind the rule already laid down: that the object of our description and descriptive drawings is so to explain our invention, that from them alone any person may, at any future time, be able to make the article or to perform the process which we are describing. If we do this we do all that the Patent Office requires of us. The most experienced agent can do no more.

We are now ready for the proper forms. It is in almost all cases better in the first instance to secure *Provisional Protection*; that is to say, protection for nine months. During that time we can test the value of our invention in the market, we can sell or make arrangements for working it with other parties, or, if we find reason to think that we have overrated its importance, we can abandon it before the expense of an actual patent is incurred, and in a general way it will give us time to look round us and determine on our future measures, we being as safe meanwhile as if the patent had actually been granted.

We, therefore, go to the Post Office and ask for a Provisional Protection Form, and a paper will be handed to us partly printed and partly blank, and it will have a stamp for which we shall be charged one pound. This paper will be marked A (if we require protection for the Colonies as well as for Great Britain it will be marked A[1]). With it will be given us, free of charge, two other papers, which will be duplicates, and these will be marked B. If these forms do not happen to be in stock at the particular office to which we apply, we can, by ordering them, have them procured for us there or at any other Money Order Office in the kingdom.

For filling up the blanks in these forms we shall find directions in their margins. On the stamped form A the application has to be made; whilst form B is for the specification: that is, for that description of our invention which we already have in draft. The blanks to be filled up in Form A are short and simple, and with the directions printed upon it to guide him no one can well err in filling them. The real work is in filling those in Form B properly. It is probable that our specification will require more space than the form affords, and, if so, we shall have to continue it on other paper, good stout wide-ruled foolscap being used of the same size as the form, viz., 13 in. by 8 in. The accompanying illustrations must be on white, smooth, rolled drawing-paper, also of the same size, and they must be drawn in black india-ink only, such shading as is introduced being in lines alone, for no washes are allowed. The reasons for these regulations with regard to drawings being that they will have to be photographed at the Patent Office. It is also required that the drawings should not be creased by folding; they must be rolled up for transmission.

The drawings, like the specifications, have to be in duplicate, and all have to be signed and dated by the inventor. When ready, these papers have (unless delivered by hand) to be forwarded to the Patent Office through the post. By return an acknowledgment will be received through the same channel; and, if they are found satisfactory, in a short space (probably about a fortnight) this will be followed by an intimation that Provisional Protection has been granted.

Perhaps we shall best show how a specification should be drawn up and illustrated by giving an imaginary example in which some well-known invention is described. Will the reader kindly carry his imagination back to a period when the *wheelbarrow* existed only as an idea in the brain of its originator? We will (without any historical authority whatever) suppose that unknown benefactor to his species to have been an ingenious craftsman of Eboracum, who, when the Emperor Severus was busied on that colossal piece of navvy-work, his rampart across this island, conceived a scheme by which to relieve the backs of his fellow-Britons, and, of course, to put money in his own pocket. He would be entitled to protection, his invention being no mean improvement on the Roman *feretrum*

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or bier previously used for burdens. His specification might run much as follows. The printed matter on the form is given in capitals or italics.

To be issued with Form A or A[1]*.*
Patents, Designs, and Trade Marks Act, 1883 *and* 1885.

FORM B.

PROVISIONAL SPECIFICATION.

(To be furnished in Duplicate.)

(a) *Here insert title as in declaration.* (a) An improved vehicle by means of which loads may be conveyed from place to place by the labour of one man only.

(b) *Here insert name and full address and calling of Applicant or Applicants as in declaration.* (b) I, Caius Constantinus Evans, of 6, Forum Street, in the County of York, in the City of York, Wheelwright and Timber Merchant, *do hereby declare the nature of this Invention to be as follows:*

(c) *Here insert short description of invention.* (c) I construct of wood and iron a vehicle by means of which one man may readily convey loads from place to place for building or other purposes, and I construct it in the following manner:—

I take two pieces of wood, by preference ash, each about 4 ft. 9 in. in length, 2 in. in thickness, and 3 in. in depth. These I dress, and form one end of each in such a manner that it can readily be grasped by the hand, as shown at A, Fig. 1. These pieces I call the "side-pieces."

In each of these, I cut mortise holes as denoted by B, C, D, the hole B being 21 in. from the end A, while D is 15 in. from the opposite end, C being midway between the two.

I shape three pieces of wood, by preference ash, 1¼ in. thick and 3½ in. wide, and cut at their ends tenons to fit the mortise holes above-named. These pieces, which I call "slotes," vary in length, as will be seen by referring to Fig. 2, where they are denoted by E, F, G, the length of E being 22 in., while G is 18 in., and F is of an intermediate length. When, therefore, the tenons on E, F, G, are fitted into the mortise holes, B, C, D (Fig. 1), and fixed by pegs or otherwise, the work will appear as in Fig. 2.

I next make the legs of my vehicle from two pieces of oak plank 3 in thick, of the form shown in Fig. 3, where they are marked H, I, and then fasten them to the side-pieces by the iron rod, K, which passes through them, and which is also shown in Fig. 2, where the legs appear in section. I further secure the legs by the pieces which I call the leg-brackets, two in number, of the form shown in Fig. 4, which are nailed to the legs and side-pieces, as appears at E, E, Fig. 9. And I further strengthen the legs by an iron rod, bent to a semicircle, which is nailed to them, and to the back slote, as shown at M, M, M, Fig. 3.

The body of my vehicle, A B, which is to be placed on this frame, is composed of a flat bed and four slanting sides or boards, all of elm. The bed extends from the front to the back slote, and from side-piece to side-piece, and the side-boards are conformable to it. Fig. 5 shows the front-board, U; Fig. 6, one of the side-boards, N; and Fig. 7, the back-board, X; and these I nail together as shown in Fig. 8. I afterwards nail the body to the slotes, side-pieces, and the sloping sides of the legs; and to strengthen it when so fixed, I take two pieces of wood of the form shown at O, Fig. 6, which I call "front-brackets," and which I nail to the side-pieces and front-board, as shown at O, Fig. 9; and two other pieces, shown at P, Fig. 6, which I call "back-brackets," which are nailed in like manner against the back-board, as at P, Fig. 9. And I still further support the sides by pieces of wood nailed to the side-pieces and into the angles formed by the projecting ends of the back and front boards, as shown at Q and R, Fig. 9.

The distinctive feature of my vehicle is that it has one wheel only. For this I prepare an axle of turned wood about 10 in. in length and 4 in. in diameter in its middle parts. My wheel differs from that of an ordinary chariot, inasmuch as the axle itself serves as its nave. Through the centre of the axle I cut a slot lengthwise about 2 in. long and 1 broad, but slightly tapering towards one of its extremities, and into this I drive an ashen spoke cut to fit it, so that one half of the spoke may project on each side. I then cut a second hole, 1 in. square, through the centre of the axle and broad spoke, at right angles to the first, and drive into it a second spoke in like manner, and trim the outer portions of the spokes down to an equal thickness as they appear at S, S, T, Fig. 9. I then complete my wheel with felloes and an iron tire in the manner usual with wheelwrights. Finally, into the ends of my axle I drive two iron pins, upon which it and the wheel revolve in two staples driven into the side-pieces, as shown at A, Fig. 9.

And the improvements and advantages claimed for this, my invention, are these: that by means of it one man may convey a greater burden, and with less labour than could have been borne in the old manner by two; also that, owing to the arrangement of its two legs, the labourer is enabled to rest, and again to resume his labour without loss of time; also, that its sloping sides allow of loading and unloading easily; also, that its single wheel permits of loads being readily conveyed along a narrow plank; and, also, that by means of a strap passed round its handles and over the shoulders, it permits the weight of the load to be distributed over the body of the labourer in a satisfactory manner.

From the foregoing specification, with its accompanying drawings, it will be admitted that any workman, who had never before seen one, might construct a wheelbarrow (possibly some reader of WORK may be tempted with such plain directions before him to make such a useful article—he may safely do so without infringing the inventor's patent); and if they enable this to be done, they fulfil the fundamental requirements of the patent laws.

In this imaginary specification, the writer has described the supposed invention fully. This is not usually done by Patent Agents when applying for Provisional Protection. Their common practice is to give no more than a bare outline of the invention; or, rather, of its principles, and to avoid drawings if possible. Why this should be we can readily understand. The writer, however, prefers to explain as thoroughly in the provisional as if it were a complete specification, and to illustrate it thoroughly; and for this reason—experience shows that inventors having obtained provisional protection, are apt to put off taking any steps towards completing the patent till the time for doing so has all but expired, when the work may be too much hurried to be done properly. Whereas if the description has been thoroughly made out in the first instance, all that has to be done at this time will probably be to make a copy of the provisional specification and refer to the drawings filed with it. A duplicate of this specification is, upon application, returned to the inventor for guidance; it is, however, better that he should have himself kept a careful copy and tracings of his drawings with their letters of reference. Of course, if he has during this time added anything to improve his invention, he will embody this in his complete specification, and if an extra drawing is required, he will make one on paper of the same size as before.

Should there be anything vague in either drawings or specifications, the specifications, if clear, will serve to correct a vague drawing, or exact drawings will serve to correct a vague specification.

Although an inventor may be provisionally "protected," he is not, strictly speaking, entitled to mark his invention as "Patent." Yet this is generally done, and, so far as we know, only one action has arisen in consequence, when the plaintiff got 10s. damages. The proper way to mark the inventions would be "Provisionally Protected;" but the word "Patent" has been so generally substituted for it that no action at law is likely to arise, unless some brother inventor of a similar article gets spiteful, in which case a jury would probably consider the *malus animus* and give nominal damages.

It should be observed that in the case of an abandoned patent—that is, when the inventor has neglected to complete his patent within the period for which provisional protection has been granted—the Patent Office will not return his specification.

Our Provisional Protection is for nine months only, and if, during that time, we have reason to be so well satisfied with the prospects of our invention as to be justified in going to the expense of a complete patent, we must, before that time has expired, apply at the Post Office, as before, for complete specification forms. Two will be given us, duplicates, except that one will bear a stamp, for which we shall be charged £3. These forms will be marked C.

On these we have to make out in duplicate our complete specification, and if, as above advised, we made our provisional one carefully, this will generally be little more than a copy of our former work, except that on the margin of Form C is a direction that the specification must end with a distinct statement of the inventor's claim in prescribed form. If distinct novelties are to be insisted on in different parts of the invention, these will have to be mentioned in the claim. Had our imaginary friend, the inventor of the wheelbarrow, introduced any new thing of importance in the legs or sides of his vehicle he would have to mention them, as well as the wheel, in his claim; but as he would consider the importance of his invention to rest on the single wheel alone, his statement of claim would run as follows:—

"Having now fully ascertained the nature of my said invention and how the same is to be performed, I declare that what I claim as my invention is a vehicle having one wheel only, and that the whole is constructed substantially in the manner above described, and for the purposes stated in this my complete specification." This he will date and sign.

As a result of this second application, we shall obtain security for a term of fourteen years, and the *right* to use the word "Patent." For these privileges we shall have to pay the sum of £150, in addition to that already paid for stamps. This we may do either in two instalments, viz., £50 before the end of the fourth, and £100 before the end of the seventh or eighth year from date; or by annual payments as follows:—Before the ends of the fourth, fifth, sixth, and seventh years, £10 each year; before the ends of the eighth and ninth years, £15 each year; before the ends of the tenth, eleventh, twelfth, and thirteenth years, £20 each year.

It may be useful to know that when an inventor has not the means of properly working his invention and has to secure the help of a capitalist to help him in so doing, the name of the person thus joining him may be associated with his own in the patent.

A FEW WORDS ABOUT SCREWS.

BY JOHN CHARLES KING.

WHEN screws are spoken of, the common screw to be turned into wood with a screwdriver is generally understood by those who hear or read about them. It is of such I now write, with remarks as to the best sorts and the most effective way to get them in and out, with the least possible trouble or injury to material they are used in.

Not a hundred years ago, the screws were so badly made that some coach makers preferred to put countersunk clout nails in the hinges of carriage doors, as the screws were apt to break off at the end of the thread part on extra strain, or if the head impinged a little more on one edge of the countersunk than the other, as the sectional sketch will show; the countersunk of the hinge being iron recessed conically and unyielding to the canted head, not at right angles to the countersunk face. The attempt to use a screw in hard wood had the same effect, but not so great. If the cone of the countersunk were fainter in its angle than the cone of the screw head, the chances of a screw breaking would be lessened, as the neck of the cone of the screw head would take the bearing on one side of the hinge, or wood countersink. The screw, as will be seen (Fig. 1), is bent out of straight at its weak part, and at every half turn round it is bent back when the opposite side of the screw is turned to B, which, in effect, is the same as holding the thread part tightly, while the stem part, A, is crooked first one way then the other, the strain being augmented also by the tightening of the thread part producing a torsion strain on the weak part of the screw.

Hinges of carriage and heavy house doors are here selected for illustration, as the result of a broken hinge screw in a doorpost or standing pillar of a coach or chariot, which would obviously be a more serious matter than a small light door, the wood generally of heavy doors and carriages being harder, and the door pillar or standing pillar of a carriage smaller than a door jam or post. A broken screw under such conditions was a serious matter in the olden time, and led to a lot of time-wasting contrivances to extract the part bedded in the pillar or post. It had to be done. One plan was to bore a larger hole from the other side of the pillar opposite the point of the screw, and punch the broken part through the hole; then plug up with a wood pin and glue, which needed a few hours to dry hard before it could be bored into for another screw. Another plan was to drive a clout nail in to fill the hole, beside the broken screw. Sometimes the head would be the trouble. If a blunt screwdriver were driven into a narrow saw cut of the head, half the head would fly off; even impinging on the hole countersink, more one side than the other, would cause the head to break half side off. If too tight in to get out, the remedy then was to leave it, and put in putty, to hide the mischief; but if not quite tight in its bedding, it had to be got out somehow, causing an hour's work, perhaps, in trying, and then probably having the other half of the head break off. To get a tight screw out of a hole without a head was not an easy task, and would puzzle workmen of the present day, with all their

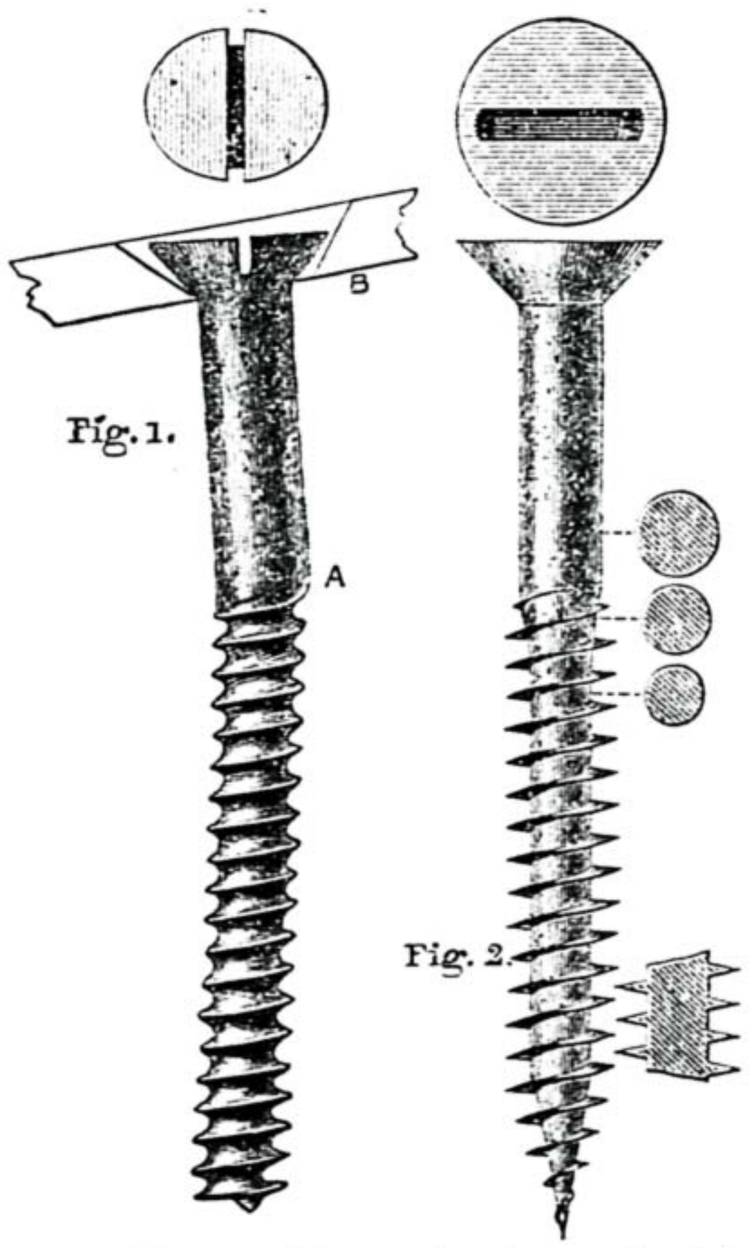

Fig. 1.

Fig. 2.

Fig. 1.—Old form of Screw, showing weak points,
Fig. 2.—New form of Screw.

handy tools they use for any troublesome jobs. It has to be done, and had to be done a hundred years ago more often than now: that is why countersunk clout nails were used in preference to screws in post-chaise and stage-coach work in many shops, and often in door hinges into oak door posts. As to the headless screw in the hole, we will explain a contrivance to get it out, which was suggested and made by a poor outcast tramp, who was looking for work. This was in the hinge of an iron gate of a nobleman's mansion. The workmen were afraid to try to draw the other screws, as the heads were as brittle as the broken one. The tramp made a fine chisel and cut the stem of the screw to the shape of a triangle, and fitted on a triangular steel pipe stem, like a short length of a padlock key. This he made square on the projecting part for an inch, and with an iron cramp forced this key tightly on the broken screw; while held thus tightly, which prevented it coming off, with a wrench that fitted the square, he turned the screw back at the same time as he turned back the thread of the cramp. It was the keen sense of touch, not eyesight, which determined the degree of pressure of the cramp screw, as the broken part was turned back far enough to enable a small hand vice to grip it, and turn it right out. We may mention that this trifling matter won the poor fellow work, and eventually, by his worth and cleverness, the place of foreman. His name was Crundle, and it may still be remembered by old men in the carriage trade in London.

Screws have been progressively improved since that time, the chief improvement being in the tougher iron used; the next, in the acute chisel edge of the thread; and the next, in the screw tapering to a sharp point, with the thread right up to the tip. The latest improvement is making the stem of the screw smaller than the diameter of the thread part, so that the old evil of having to make a big hole in one piece, to prevent it being "stem-bound" and not drawing, is averted, though a smaller hole is used. The illustration of the screw in Fig. 2 shows this. Finally, the head breaking half off is made almost impossible, as the cut does not extend to the edge of the head, but is as a mortise in it, as the diagram shows, the sharpness of the cutting thread being augmented in keenness at each improvement. It all looks simple enough, and the old remark, "any one could have thought of that," drops short when we refer to the metal of which these are made; it is a mild steel of intense toughness, and they are made by elaborate machinery, so that the "bogy," cost, shall not arise to baulk its introduction, and it is swaged and rolled *cold*. This is one demonstration of the superiority of the metal used; again, the cutting is done laterally, not longitudinally, which makes a feeble thread, so that there is right talent evinced in this improvement shown at the Exposition Universelle by the American Screw Company, of Providence, Rhode Island, U.S.A.

ECONOMICAL ROOF-COVERING.

A NEW MATERIAL FOR ROOFING SUMMER-HOUSE, FOWL-PEN, OR DOG-KENNEL.

BY JOHN W. HARLAND.

I HAVE been much exercised for the last year or two to find some material for covering roofs of temporary structures that should possess the desiderata of inexpensiveness, efficiency, and durability, combined with an ornamental appearance, and which should not be too heavy for the purpose. Not only for my own constructions, but for those of numerous acquaintances, has this question been forced upon me, and I have tried several plans, such as thick brown paper soaked in boiled linseed oil, or laid on the roof with equal parts of resin and Russian tallow applied boiling hot, or with a solution of resin in paraffin. All these methods, however, failed, owing to the sun affecting them; they answer only one condition, *i.e.*, being waterproof, but not heatproof. Paper treated in any of the above ways is thoroughly waterproof as a lining for cisterns where no heat or frost can attack it, but as a roof-covering is very perishable, though it appears to answer very well at first for a few months. It can be made to look rather ornamental by means of a coat or two of paint, but this soon blisters in the sun and becomes unsightly. It does not keep out the heat to any extent. Slating and tiling are heavy, and necessitate building the roof much stronger, costing in material and time a considerable outlay.

Under these conditions, it struck me that floor-cloth, linoleum, and kamptulicon, might

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answer the purpose, and, accordingly, the experiment was made; the result was a perfect success. Readers of WORK, therefore, will, no doubt, appreciate some account of the way in which it is utilised. Firstly, floor-cloth which has been laid down upon boards wears out at the joints of the boards, and cuts through long before the other parts are worn at all, and very frequently is taken up and replaced by new for appearance' sake, because the pattern gets partially worn off. Even when the greater part is thoroughly worn out, corners and other parts which have been under articles of furniture are better even than new, having had the advantage of long seasoning. There are few houses where, in some lumber room, stowed away, such old cloth cannot be found, and, if not, every furniture broker has pieces of all sorts which may be bought for a shilling or two. The first operation is to cut up the cloth or linoleum into slate-shaped pieces of about 6 in. in width and 13 in. long, rigorously excising every bit of worn-out stuff and every part that has been pierced by tacks. So long, however, as the pattern only is worn off, the cloth is just as good for our purpose as if it were new.

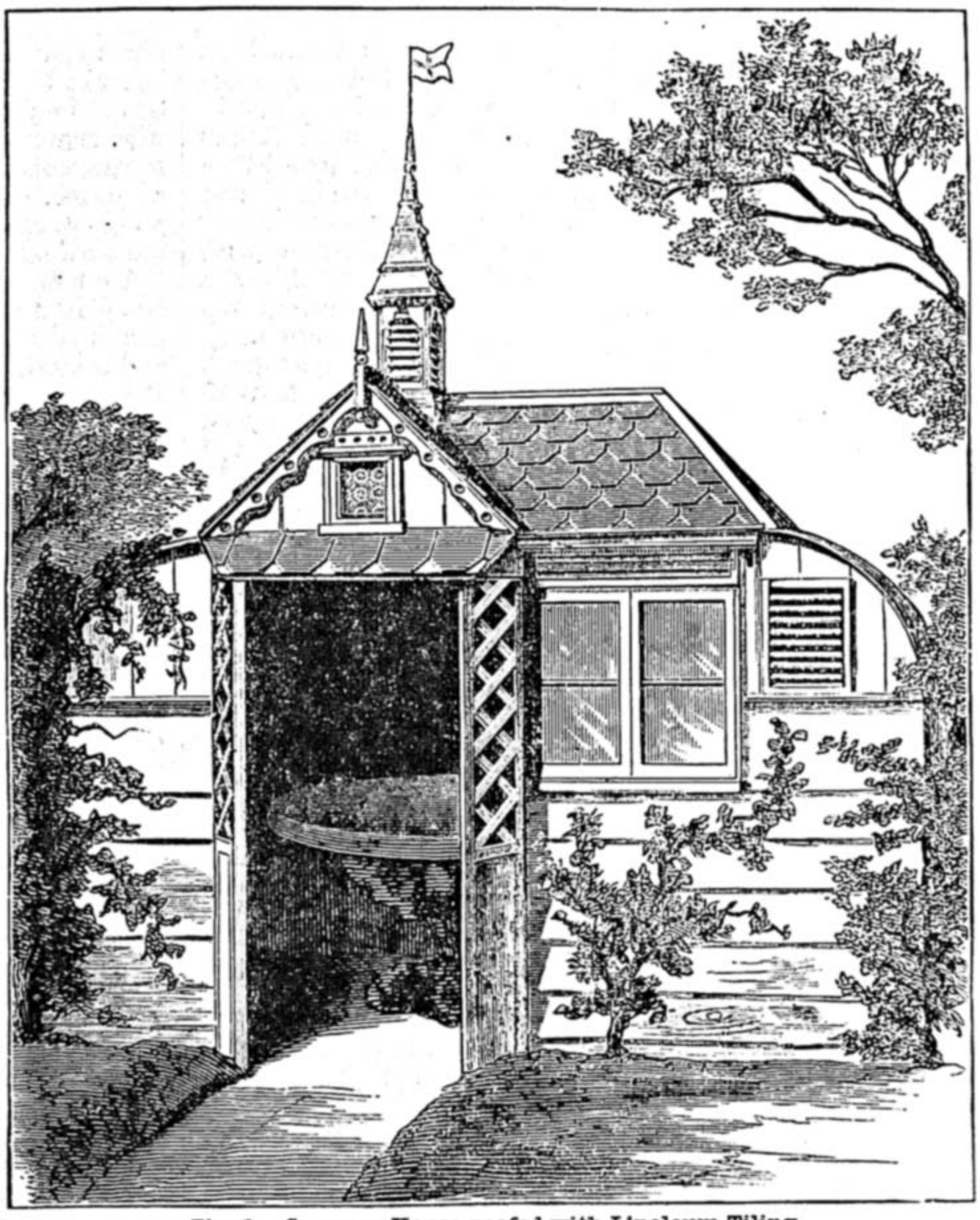


Fig. 1.—Summer-House roofed with Linoleum Tiling.

Having cut a sufficient number of pieces all exactly one size, they may be made more ornamental by cutting off two corners at *one* end, at an angle of 45 deg. or 50 deg. (Fig. 2). My readers have, no doubt, observed that many floor-cloths are of a deep Indian red at the back, others of a terra-cotta hue, others dark, and others lighter stone colour; this should not be lost sight of, for herein lies its capability for ornamentation, for it is the *back* of the cloth we use uppermost.

Suppose, now, the roof is ready to receive the covering: instead of the rafters being slate-lathed, they should be boarded over with thin boards; for this purpose almost anything is good enough—old egg-boxes, "slabs" off logs of timber, or other old stuff, which need neither be planed nor close-jointed: it is merely to support the oil-cloth or linoleum slates.

Now commence by putting on at the eaves with ¾-in. *tinned* tacks a strip of cloth the whole length, about 9 in. wide, nailing it along the upper edge only, and allowing it to overhang the eaves about 1 in. Then lay the first band or row of your floor-cloth slates with their lower edges flush with that of the strip you have just nailed on, tacking them down only at their lower edges; then lay 4 in. higher up your second band of slates, nailing them only at the lower edges: for these tacks will go through the row underneath as well and thus securely fasten them. Care should be taken that the joints of the second row should come opposite the exact centre of the first row. If care has been taken to make them all one size, you need only measure the first of each row, the rest will fall exactly in their proper places. Proceed next with the third row, the side joints being made to fall in line with the first row and 4 in. higher up, and so on with the next row or band (see illustration, Fig. 2), when you will find that throughout, as in actual slating, you have *three* thicknesses of covering, the lower edge of the fourth band overlapping the upper edge of the first just 1 in., thus ensuring its being absolutely water-tight. If you continue until the ridge is reached, you will thus have to cut the last band of slates but one 4 in. shorter, and those of the last—*i.e.*, the top row—8 in. shorter, so that these all finish at the ridge. Or, if you find that you can utilise other portions of your cloth that will not cut full-sized slates, so much the better, as you avoid waste.

With a little taste and forethought, by laying out your slates on a table, you may add quite an artistic tone to your roof, by arranging, say, two or three different colours of cloth either in bands or patterns and other combinations, the effect at a short distance being quite that of flooring tiles, whilst the peculiar colour harmonises with either the bright greens of spring or the brown and golden tints of autumn foliage.

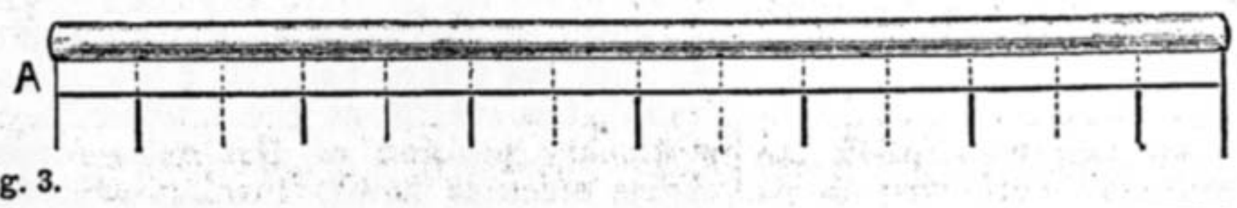
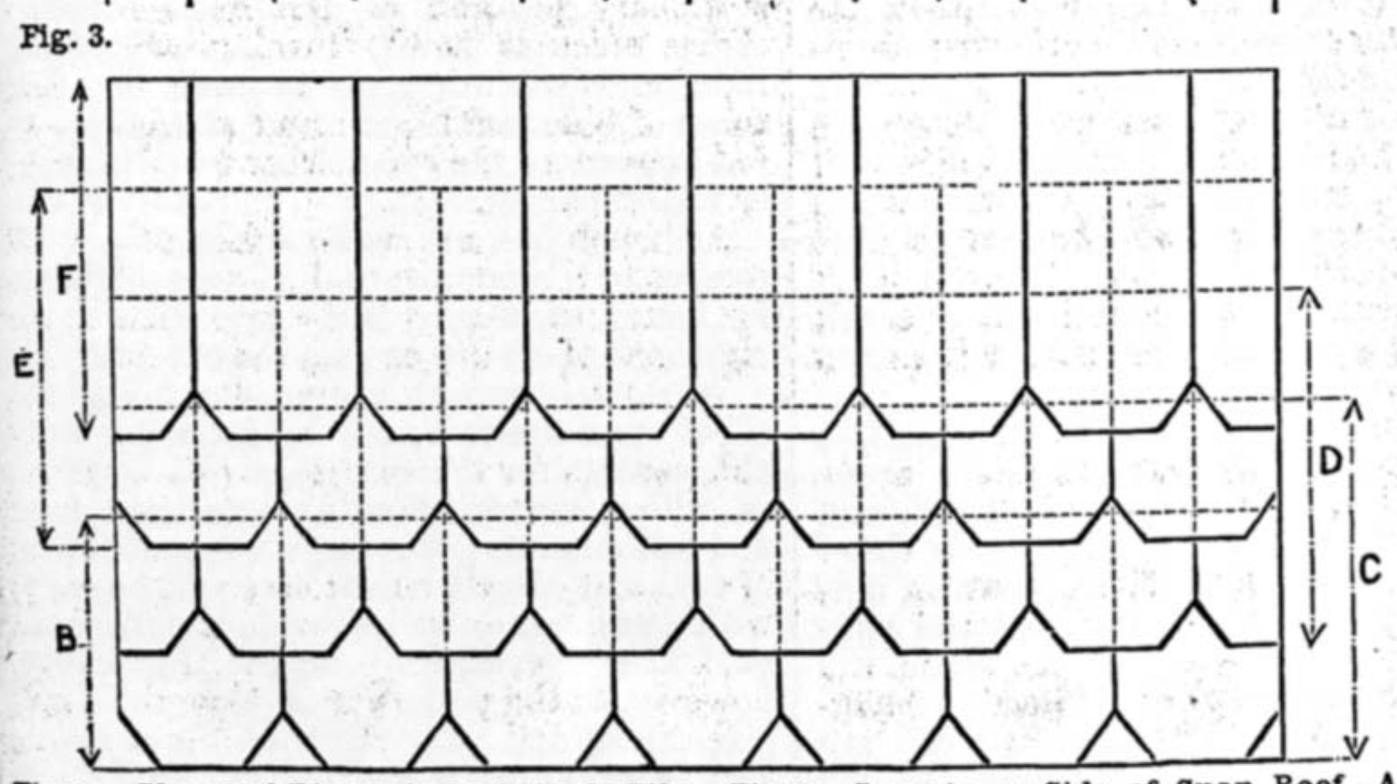


Fig. 3.



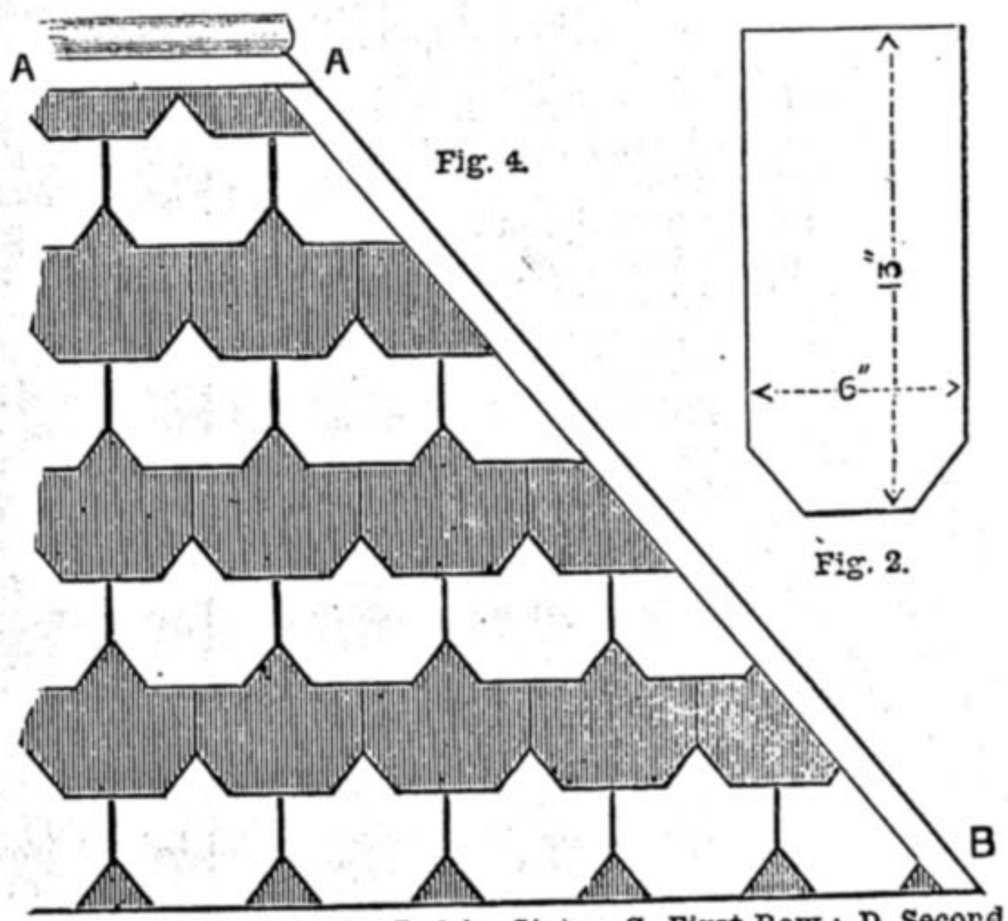


Fig. 4.

Fig. 2.

Fig. 2.—Plan and Dimensions of Single Tile. Fig. 3.—Lean-to, or Side of Span Roof—A A, Ridge Roll of Zinc; B, 9 in. Strip; C, First Row; D, Second Row; E, Third Row; F, Fourth Row. Fig. 4.—Hipped Roof—A A, Ridge Roll of Zinc; A B, Zinc Flashing.

I have hitherto endeavoured to generalise as much as possible for clearness' sake that our remarks might apply to all light, temporary roofs; but it is necessary to point out different modifications entailed by different forms of roofs, viz. (1) a "lean-to" or shed roof, (2) a "hipped" roof, or (3) a "hipped and gabled" one.

In the first (1), the simplest form possible, every alternate row or band commences with a half-slate, *i.e.*, with a piece cut 13 in. by 3 in., instead of 13 in. by 6 in. The ridge slates being cut to finish, as before described, at the wall to which the roof leans, require simply flashing to make them good at their junction with the wall. This is done as follows:—Scrape out the mortar between the two next courses of bricks in the wall just above the roof, and insert the edge of a strip of cloth the full length of the roof, wedging it in with small wooden wedges, say every foot or so apart, and then fill in with Portland or Roman cement, and point the joint over the cloth, or, instead of cloth, thin zinc may be used, tacking down the lower edge here and there to the roof.

In a double shed roof, such as a dog-kennel, the ridge is made by nailing over the top a strip the whole length, overlapping both sides for two or three inches, and over it nailing a ridge roll of wood to keep it well down, which may be grooved at top to receive a cresting if desired.

In "hipped" roofs (2) the oil-cloth tiles have to be cut to the angle at the "hip" rafter, and before the ridge flashing is put on the hip should be made good with a strip of cloth or zinc nailed down over the cut edges of the slates, and the ridge flashing then nailed over its upper end. (See Fig. 3.)

In a "hipped and gabled" roof (3), where the gable roof mitres with the main roof, the "valley" must be laid first with either cloth or zinc about 3 in. on to each roof, and the tiles should be cut to the angle about an inch from the angle itself on both roofs, leaving the valley exposed to view 2 in. wide altogether, thus leaving a clear channel for the water. At the ridge, the strip for making good, whether cloth or zinc, should have a 4-in. piece laid under the mitre joint, or else be twined round one over the other and made good, the ridge roll being also mitred.

Having thus shown how to construct this roof in various ways, let me point out its capability of economic maintenance in good condition. Instead of the trouble and inconvenience of hot tar or asphalte (as in the case of roofing felt), all that this roof requires is periodically to give it a coat of boiled linseed oil, and half its volume of turpentine or terebine laid on as paint. Or, if preferred, it can be painted from time to time either in a self-colour, or in patterns, etc., as desired. In any case, the edges of each tile should be painted over with oil and turps before laying, which leaves them the same colour as before, and preserves them from the weather.

This novel covering excludes heat as well as moisture, is very durable, looks quite artistic, and costs next to nothing. In Fig. 1 is given an illustration of a summer-house roofed with it (from a photograph), which is thoroughly satisfactory and successful.

SOLID LETTERS FOR SHOP-FRONT FASCIAS, ETC.

BY B. A. B.

If it is not going "beyond my last," or, in other words, going from my business into the domain of the author of the excellent papers on "Sign Writing and Lettering," I should like to tell the readers of WORK how, owing to Mr. Benwell's articles, I made some solid letters for shop fascia.

First, I ascertained what sized letters would best suit my purpose, and found 7 in. would do well, and that note-paper is just that dimension. Mr. Benwell's outlines of sans-serif served as models, and armed with a pair of scissors, a black-lead pencil, and a straight-edge gauged to the width of the letter I, very little difficulty was experienced in obtaining fairly good, well-formed letters. X gave a little trouble, but note-paper is cheap, and I made another essay. The letters being now cut in paper and satisfactory in shape, were glued to a piece of ¾-in. deal, using judgment to obtain a suitable way of the grain. This was believed to be upright, and all the letters except T, which was formed of two pieces, mortised and tenoned together, were cut out with a bow-saw just outside the paper pattern, so that with sharp chisels and gouges, the wood could be reduced exactly to the size of the paper letter; a shooting-board was found very useful for B's, E's, R's, etc.; a coat of ordinary paint was given to the letters all over, and any fibre which had been left unnoticed before, now that the paint had caused it to show more prominently, was carefully pared off with a sharp chisel, and another coat of paint applied to front and edges of letters. I ought to mention that no stops except full stops were required, and that those were made of square pieces of wood, the sides of the square being the same as the width of the upright member of the letters. The finishing colour was next debated, and some preference was felt for a gilt surface, especially as Opifex had recently given some hints on gilding, but, finally, I decided to have white letters with red edges. For the white, white lead, turps, some crystal varnish, and a little ultramarine were mixed; the edges were painted with white lead, vermilion, and crystal varnish mixed together and finished with a coat of Urquhart's "carmine tint" enamel. These letters fixed on a dark green ground are very satisfactory, and there may be among the readers of WORK many who, like myself, would like an effective sign, but are not blessed with very heavy purses, and to whom the alternative is either do it yourself or do without.

Now the letters must be fixed, which reminds me that very small brass plates, such as card-board almanacks and price lists are sometimes furnished with, would be excellent for the purpose, and probably could be purchased of wholesale stationers or ironmongers who stock for fancy leather workers — ordinary ironmongers' plates are too heavy. Being unable to procure suitable plates my letters were fixed with fine wire nails or panel pins well punched in, and holes stopped with white lead, with just a touch of ultramarine blue to match. Such letters can be read with the least possible light, and the coloured edges give a solid appearance as the spectator approaches.

Encouraged by the success attending this attempt, another idea was suggested. Some zinc about No. 10 gauge was in hand, and why not try and cut some letters in that? Still keeping close to Mr. Benwell's outlines, a piece of wood was cut out and carefully squared, every letter was made the height by this one piece of wood, remembering the axiom, "things which are equal to the same thing are equal to one another." Of course, the width of the letters varies from M or W, the widest, to I, the narrowest. S and O were the only difficult letters; U and P, and similar letters, might be cut in part with a centrebit, or marked with compasses; a strong pair of scissors or shears, chisels, gouges, and a half-round file, a hammer to flatten the zinc when required, a mallet, and a flat piece of wood to cut on, are all the tools required.

To make these letters into words, two No. 0 iron rods were taken, and some waste pieces of zinc bent round the rod closely and soldered to the back of the letters, two at least to each letter. Having all the letters now on the rod, they can be carefully spaced and the rod filed, and a bead of solder put upon the spots where zinc and iron meet. The whole can now be painted, and were coloured white as before with a touch of blue in it; but against a bright sky, or when light slates in the full sunlight form the background, white is almost invisible, so red was tried and found a success; the backs of the letters, however, had better remain white. K, R, and other letters, look very odd when seen from the back.

Some people, however, are more attracted by the back and its odd appearance, and so take special trouble to spell out the sign, and, no doubt, remember it the better for their trouble. This is written to encourage the readers of WORK to make use of the excellent articles which are placed within their reach; even when, as in this case, the directions are not exactly followed, the spirit or suggestive force of the article is often the most valuable, that is, of course, to those who read with a purpose, and they will find that information they had hardly thought of any value at first becomes almost an inspiration, often becoming a means to an end, a way by which the desired object may be reached.

PLAIN AND DECORATIVE HOUSE PAINTING.

BY A LONDON DECORATOR.

BLUE AND BLACK PIGMENTS.

In the preceding paper upon this subject of house-painters' pigments, we considered the most useful amongst the Whites, Yellows, and Reds—both for oil and distemper preparations. Therein was enumerated only those which were requisite or advisable for practical and every-day use, taking the mind of my reader from the starting-point of white, at the head of the scale, down through the yellow and red pigments, and leaving the subject at the intermediary or stationary position of the reds—*intermediary*, since it is the turning-point from light and warm aspects towards the cool tones of blue and black; and *stationary* as red appears to the eye neither an advancing or retiring agent.

Although we are not so fortunate with respect to the number and variety of blues for house painting as is the case with warm pigments, there are enough for our purpose.

Warm schemes of colour, depending for effect upon the reds, are by far more suitable aspects for the climate of this country, in which, notwithstanding occasional long and hot summers, we get a preponderance of cold and cheerless weather; and, happily, with these we are well provided, both from natural and artificial sources. Returning, however, to the pigments of blue, the most interesting and important of these are a variety of preparations known under the generic name of *Ultramarine Blue*. Of

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all pigments in our use and knowledge the real ultramarine blue is by far the most pure and costly, and has been known and used from the time of the first Pharaohs. Its name is derived from the Latin *ultra*, beyond, and *mare*, the sea; and by the ancient Greeks it was known as Armenian blue. Its true natural source is a precious stone called lapis lazuli, of a beautiful azure colour, marked with fine golden veins, and principally obtained from Persia and Siberia. In the recent Inventions' Exhibition at South Kensington I noticed amongst the Persian exhibits some small table-tops formed from this precious stone; they were about eighteen inches in diameter, and were marked at £90 each. In the Geological Museum in Jermyn Street, London—an institution that is, I am afraid, as little known to the average worker as its contents are equally valuable and interesting—there can be seen small specimens of the stone in its natural state, and then the resultant pigment of ultramarine at its side, as well as figures denoting its commercial value. I will here venture to digress from my subject to earnestly advise any student or worker, whose avocation or inclination brings him into contact with pigments and colours, to visit this comparatively little-known museum and to dip into the mine of information upon all kinds and classes of colours and pigments therein contained—for never will his time, I am convinced, be better expended. Returning to my subject, and looking upon it as a pigment in use to some extent at the present time, I find, in George Rowney & Co.'s catalogue, that four qualities of genuine ultramarine blue are therein quoted, ranging from £3 3s. up to £7 17s. 6d. *per ounce*.

Notwithstanding this fabulously priced article has little relationship to house-painters' pigments, I venture to think that the above brief *résumé* of the real and original blue will not be without interest to my brother-workers in paint.

French and *German*, or factitious *Ultramarine*, is, however, a commodity that most painters are familiar with. It is prepared artificially in a great number of qualities, and retailed, consequently, at an equal variety of prices. It is always sold in the form of a fine powder, at prices ranging from 1s. 6d. to 3s. 6d. per lb. for house-painters' use. It is a most useful pigment, possessing much purity and brilliancy, is permanent, and can be mixed with either oil or distemper paints.

Coming next in order of usefulness we have *Lime Blue*, a cheap powder of somewhat similar colour to ultramarine, but far less pure and strong as a stainer. As its name implies, it is useful only for mixing with water preparations of chalk-lime or whiting (carbonate of lime), and is much used by the paper stainer for cheap goods. It is practically useless for oil paint. A fair quality should be retailed at 6d. per lb.

Prussian Blue is one of our most useful pigments, and is a chemical preparation derived from a mixture of iron and potassium salts of the compound cyanides of iron; or, to put it more simply for the ordinary worker—a combination of Prussic acid, iron, and alumina. It is a blue of much beauty and strength, not quite so pure as ultra, but possessing a slight tinge of green, which, however, makes it none the less useful and beautiful for the painter's use. Some authoritative writers on the subject credit Prussian blue with the property of fluctuating—losing and gaining colour—according to the preponderance of oxygen in the air. Although I do not question their conclusions, the experience of many years' use under all ordinary conditions gives me perfect confidence in its general reliability for oil painting. It gives very fine tints of blue in admixture with white lead; added to black, in small quantities, it makes that neutral appear still more black and intense; whilst its brilliancy and transparency make it very useful for glazing over metals—gold and silver leaf—a process so much used at the present time in decorating Linerusta-Walton, Tynecastle tapestry, Anaglypta, and such-like modern relief wall-hangings. Some notion of the strength of Prussian blue as a staining pigment may be gathered from the fact that ½ oz. ground in oil would stain, say, 20 lb. of white lead paint to a decided light blue. It is seldom used in water or distemper painting, as it does not show the same qualities of brilliancy and permanence as when used in oil. Its price is about that of good French ultramarine: it is always sold ground in oil or water, being too hard for the worker to grind or mix it himself from its raw state.

Cobalt Blue is a pigment seldom used by house painters, being about three times as costly as the two last mentioned. It is second only to genuine ultramarine for beauty and purity of colour, and is much favoured for using as a sky blue, both in oil and water painting. It is not, however, nearly so strong a stainer as Prussian blue, but is thoroughly permanent and reliable in oil and water.

Antwerp Blue is a very similar preparation, both of source and qualities, to Prussian blue; used as an oil glaze it is somewhat brighter and greener, but it is neither so intense or so permanent as the latter, either in oil or water.

Indigo Blue is an ancient pigment of the nature of a dye, obtained from herbaceous plants which grow in India and other hot countries, and is usually sold dry in the form of little knobs. The finest comes from Bengal, and the annual value of the total quantity imported into this country is given by one authority at £4,000,000. In its colour qualities and appearance it somewhat resembles Prussian blue, but it is very inferior to that pigment for oil painting. It is for water-colour purposes that indigo is invaluable. It is one of the most useful pigments for distemper tints that we have, and is just as permanent in water as it is unreliable in oil—that is, if good and pure indigo is used. The price, however, prevents its use to any great extent in house painting, being about four times as expensive as French ultramarine.

Blue Verditer, a preparation of copper, is a very pure and pretty light blue. As it is serviceable only in water, and is not thoroughly permanent, its use is chiefly confined to the paper-stainers.

This list of blue pigments is, I think, comprehensive enough for all ordinary, and more than ordinary, requirements of the trade; we will, therefore, now turn our attention to those at the bottom of the scale, viz., the neutral blacks.

Ivory Black is at once the purest and blackest of all black pigments. Its name is derived from the supposition that it is, or was at one time, produced from burning ivory. The ordinary ivory black, however, is prepared by charring bones, in closed vessels, by a very strong heat. It is most often termed "drop black," and this by reason of its being usually sold in the form of drops, or knobs, when in its dry state. It is a very strong stainer in either oil or water, but it is most invaluable ground in turpentine, for producing flat or "dead" black paint, for various purposes. Its price retail is about 1s. per lb.

Lamp Black is, as its name implies, carbon given by the soot from resinous or oily flames, and is obtained for commercial purposes from factories where the preparation of turpentine and tar is carried on. It is a good black, but not so intense as "ivory," being more of the colour of Indian ink. It is very useful in either oil or water, and is quite permanent.

Vegetable Black is a similar article obtained, I believe, by burning vegetation. It is wonderfully light, and therefore rather troublesome to mix and handle.

Black Paint, as it is usually termed, is a preparation of these common blacks, but is ground in linseed oil to the form of a thick paste, very useful for common painting.

Blue Black, as its name suggests, is a pigment of a blue hue of black. Its source is charcoal, and its blue tone results from the thorough burning and levigation it goes through, as well as being due to the wood used in the first instance. It is very serviceable as a water-colour pigment, and is indispensable to distemper work generally. Although it is not much used—that is, the finer kinds—as an oil stainer, it is, nevertheless, useful and reliable as such; its price is about 3d. per lb. retail, for the ordinary dry colour, up to 1s. 6d. for the finest qualities, in oil.

Besides these artificial or burnt blacks, there are occasionally to be met with earth blacks, in the West of England and Wales, as well as black chalk, in their native condition. Generally speaking, they are not very pure in colour, nor do they exist in sufficient quantities to warrant my considering them herein as ordinary black pigments. *Black Lead* is a form of native pigment we all are familar with, but, notwithstanding it possesses certain estimable qualities of permanence and purity, we seldom look upon it in the light of a painter's pigment.

BLOWPIPES AND BOBS.

BY GEORGE EDWINSON BONNEY.

Blowpipe.—A blowpipe of some sort is a necessary tool in an electro-plater's equipment. The mouth blowpipe has a wide range of usefulness as a soldering tool and as an instrument in the laboratory. An ordinary plumber's or tinman's blowpipe made of brass, and costing from 6d. to 8d., will serve every purpose. This is improved by having a few inches of the mouthpiece silver-plated. For the heavier work of hard soldering, brazing, and smelting small quantities of metals in the laboratory, no better tool can be found than the gas blowpipe made by Fletcher, of Warrington, when worked with one of his foot blowers.

Bluestone.—The name given to copper sulphate on account of its likeness to lumps of blue stone. See *Copper Sulphate*.

Bobs.—These are small wheels made up of discs of leather and other materials fastened together. When placed on the spindle of a polishing lathe and caused to revolve, they are used for abrading and polishing goods to be plated. Bobs are made of thick walrus or hippopotamus leather, or of bull-hide, or of other tough leather, and are then used with Trent sand or glasscutter's sand. For finer work they are made of felt, fustian, or other tough soft textile material, and used with fine sand or some other abrading or polishing material. See note on *Polishing*.

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A COMBINED PORTFOLIO STAND AND DOUBLE MUSIC STAND.

BY JAMES SCOTT.

I THINK that the article shown in the accompanying drawings would make a useful piece of furniture for the drawing-room.

As will be seen, it answers the purpose of a portfolio stand, where the music can be stowed when not required, and a double or single music stand.

Being used as a double stand, all the portfolios (required or not required) will have to be taken out for the time being; but he who has a soul inspired for music will hardly be the one to grumble at this.

As it can be adjusted to any height, this will be found of great convenience, for the musician can then either sit or stand; moreover, supposing his better (or worse?) half should have a soul similarly inspired to his own, she can sit or stand opposite to him, at the other half of the stand. But whether

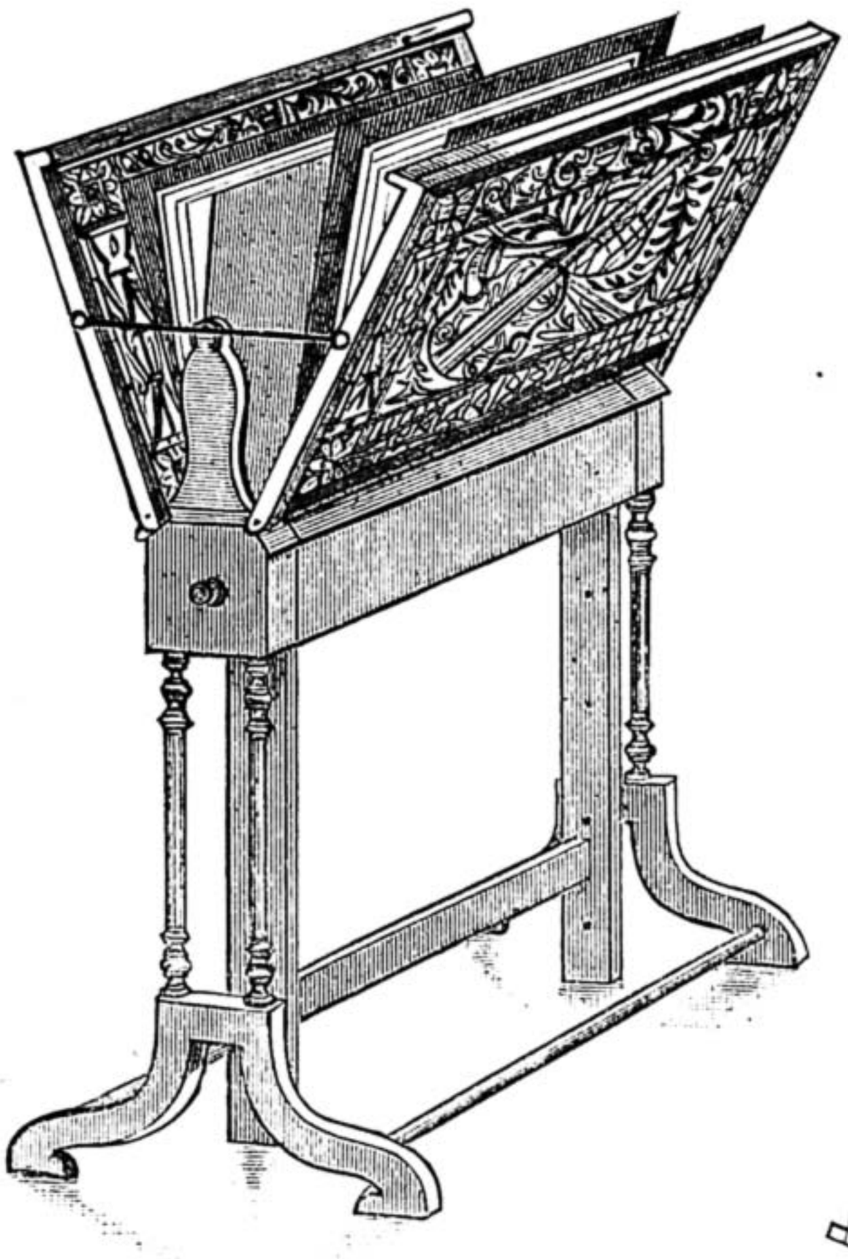

Fig. 1.—Stand with Frames up, adapted to receive Portfolio.

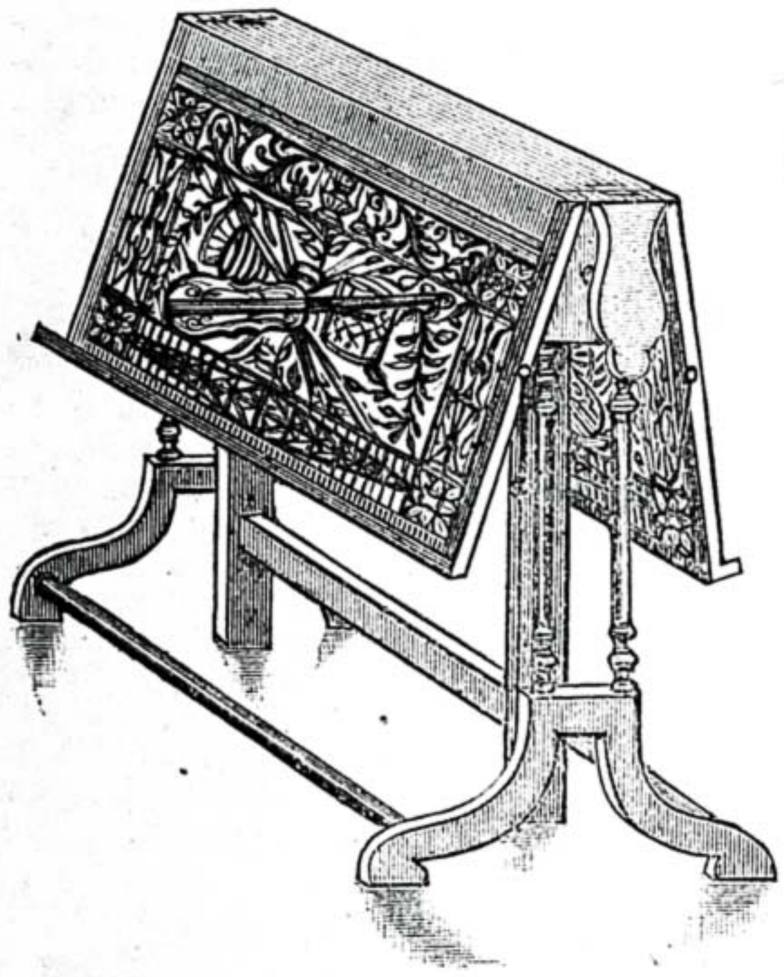

Fig. 2.—Stand lowered with Frames down.

they both agree or disagree to play the same tune, there is one thing they must both agree upon, and that is either to sit or stand together. If the one half should feel disposed to stand, and the other half feel disposed to sit, I trust they will both forgive me, for although I suppose it would not be an impossibility to satisfy them both at once, still, I have done as well as I can for the present.

It is customary, when giving a drawing, to describe it in a written article, but although some men—and they are generally professional workmen—say that they do not see the necessity of doing so, it will most always be found that an admirer of any particular design feels an interest in reading about it, although, perhaps, the drawing may sufficiently explain the working of the article.

To furnish a description, then, must be my task.

I will not advise any particular wood for it to be made in, as that must be a matter of choice.

Our blocks at each end must be 4 in. wide, 4 in. high, and 2 in. thick, with a hole bored through the centre of each, to admit the movable peg, which should be about 4 in. long, including the knob.

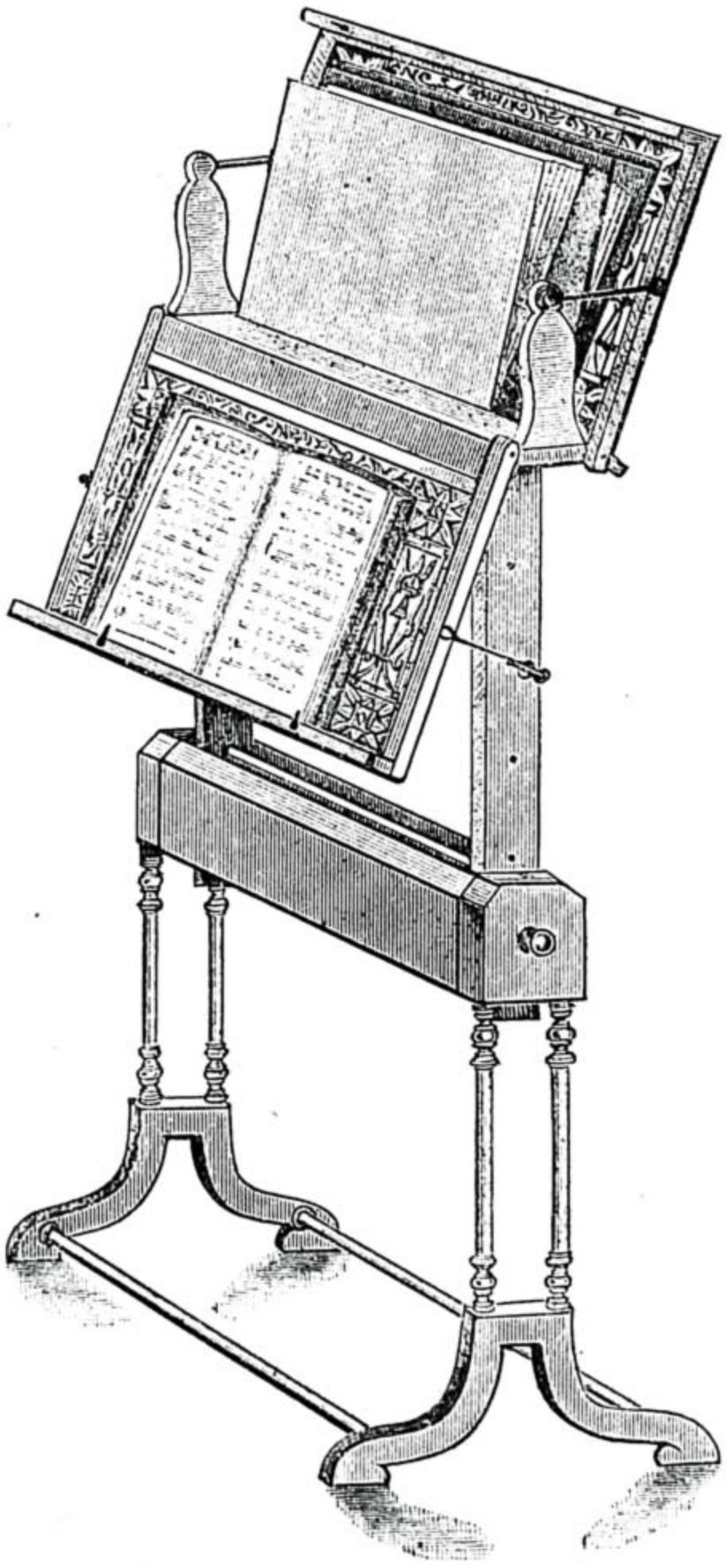

Fig. 4.—Stand with one Frame down as Music Stand, and one Frame up as Music Portfolio.

The turned columns can be obtained at almost any turner's, the four upright ones being 18 in. long, and the two stretchers 12½ in. These must be carefully fitted to the blocks and feet, otherwise, the job will become rickety in a very short time. A word or two as to fixing these columns will not be out of the way, as it is very probable—taking into consideration the numerous letters I have lately read in "Shop"—that there are among my readers several amateurs.

Drill a hole exactly in the centre of the column, place a little sawdust, or other dust, into it, and, after turning the block upside down, place the column in its position, and give the other end a tap; this will cause

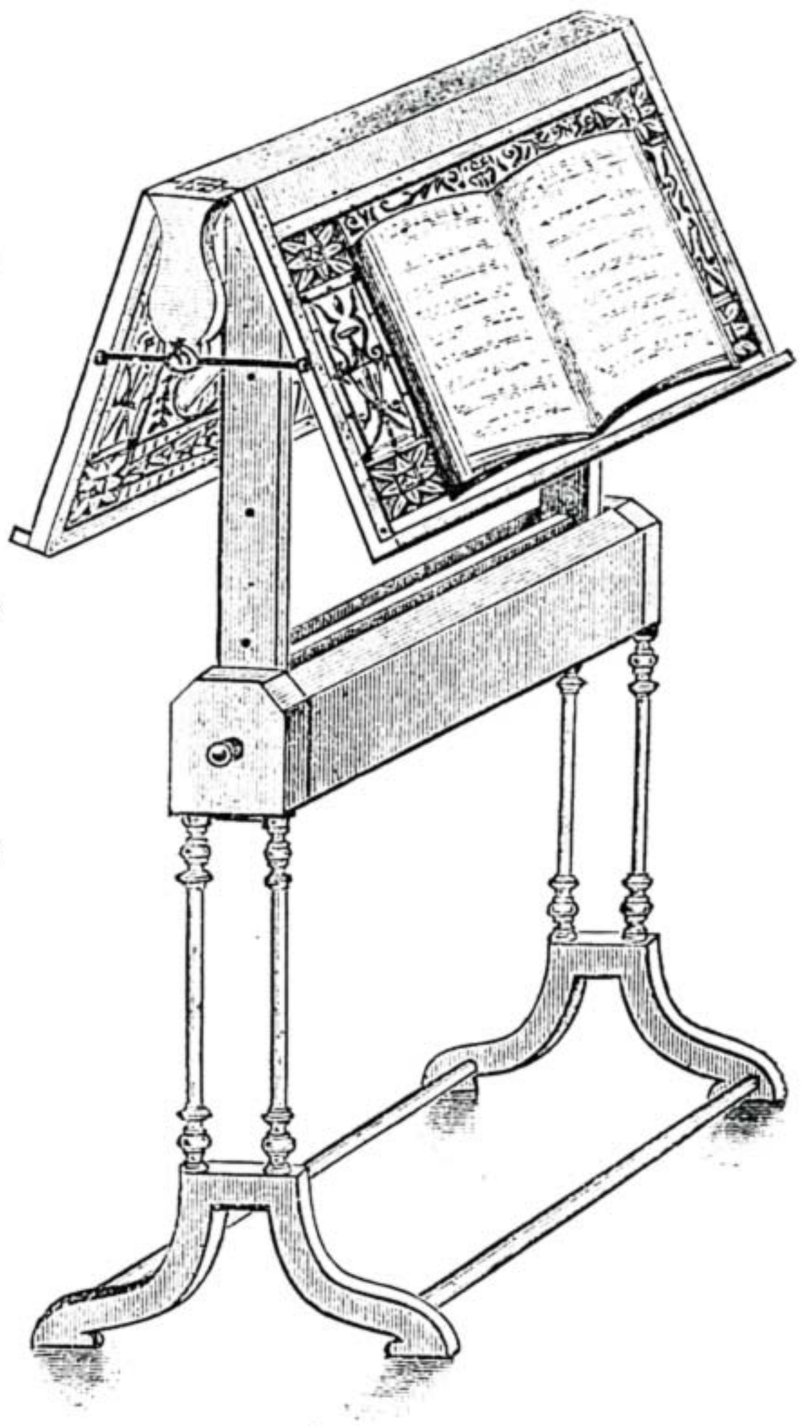

Fig. 3.—Stand raised and in position as Double Music Stand.

the dust to be left in precisely the spot where the hole must be drilled. Then have a rounded piece of wood, one half its length, glued into the column, and the other half into the block. Proceed the same with the stretchers and feet, getting them together first. I believe this plan is about the best one to adopt in order to secure strength. Of course, the fixing of the pillars should be left until the top part, with the block at each end, is fastened together.

Two pieces of wood 12 in. long, 4 in. deep, and ¾ in. thick, should be joined to the blocks as shown in Figs. 1, 2, 3, and 4, so as to allow space for the under framework of the movable part to work in. Cut the outside edges off diagonally for ¾ in.

Next we have to deal with the bottom part on to which the music frames are fastened. The centre piece of wood should be 16 in. long, 3½ in. wide, and ½ in. thick; the two outside pieces should be the same length, same thickness, and 1½ in. wide. Round off the outside edges of the two side pieces, and after having canted the two

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edges of the centre piece, sufficiently fasten the three together.

Our frames must be made of stuff ½ in. thick and 1 in. wide. Each frame will consist of two pieces 18 in. long; and two pieces 14 in. long. The rail which is fastened on the bottom part of the frames is fixed at about 1½ in. from the end of the side rails, to allow for the free movement. Then glue a strip of wood along the edges so as to hold the music. When the frames are ready, fasten them on to the bottom piece at the sides by means of stout pins, so that they will work freely up and down.

The under framework needs little commenting upon; the two side rails must be 30½ in. long, and 2½ in. wide, and ½ in. thick. The cross rail must be a little stouter, the same width, and 12 in. long. These are the lengths before they are joined together.

In shaping out the feet I should advise the amateur to proceed upon the admirable plan suggested by "O. B." in No. 14, page 209. I have drawn my diagrams of the feet and shaped wood to 6-in. scale, so that it is only necessary to enlarge the squares to double their present size.

The squaring method should be practised more than it is, as it is in every respect an excellent plan for reducing or enlarging either pictures or diagrams. Every professional workman should use this mode of procedure in making full-size working drawings from drawings to scale. It saves a great deal of trouble in determining measurements corresponding to those in the original.

I recollect once reducing in this way one of the double-page illustrations in the *Graphic*, of the well-known picture of the elephant demolishing the toll-gate, to about one-eighth the size.

It will be seen that in Fig. 4 I have shown one frame up with the portfolios still resting against it, and the other frame down as a music stand. I think it will be found that the feet are wide enough to prevent the whole affair from toppling over when in this position, provided the portfolios are neither too large or heavy.

With regard to the hooks, if the holes in the upright rails are bored at short distances apart, a long peg can be placed in one at each side to hold them.

When used as a double stand, if it is found that the hooks when linked together do not keep the frames sufficiently firm, and the peg and hole arrangement is not admired, I should advise the shaped piece of wood to be hinged (not glued) to the bottom part; it will then fall down, and can receive the hooks in the same manner as when up, if a peg is fastened on both sides. The fixing of this piece of wood should be left until all the rest is put together. It should be about 8 in. long, by 3 in. at its widest part (see Fig. 6).

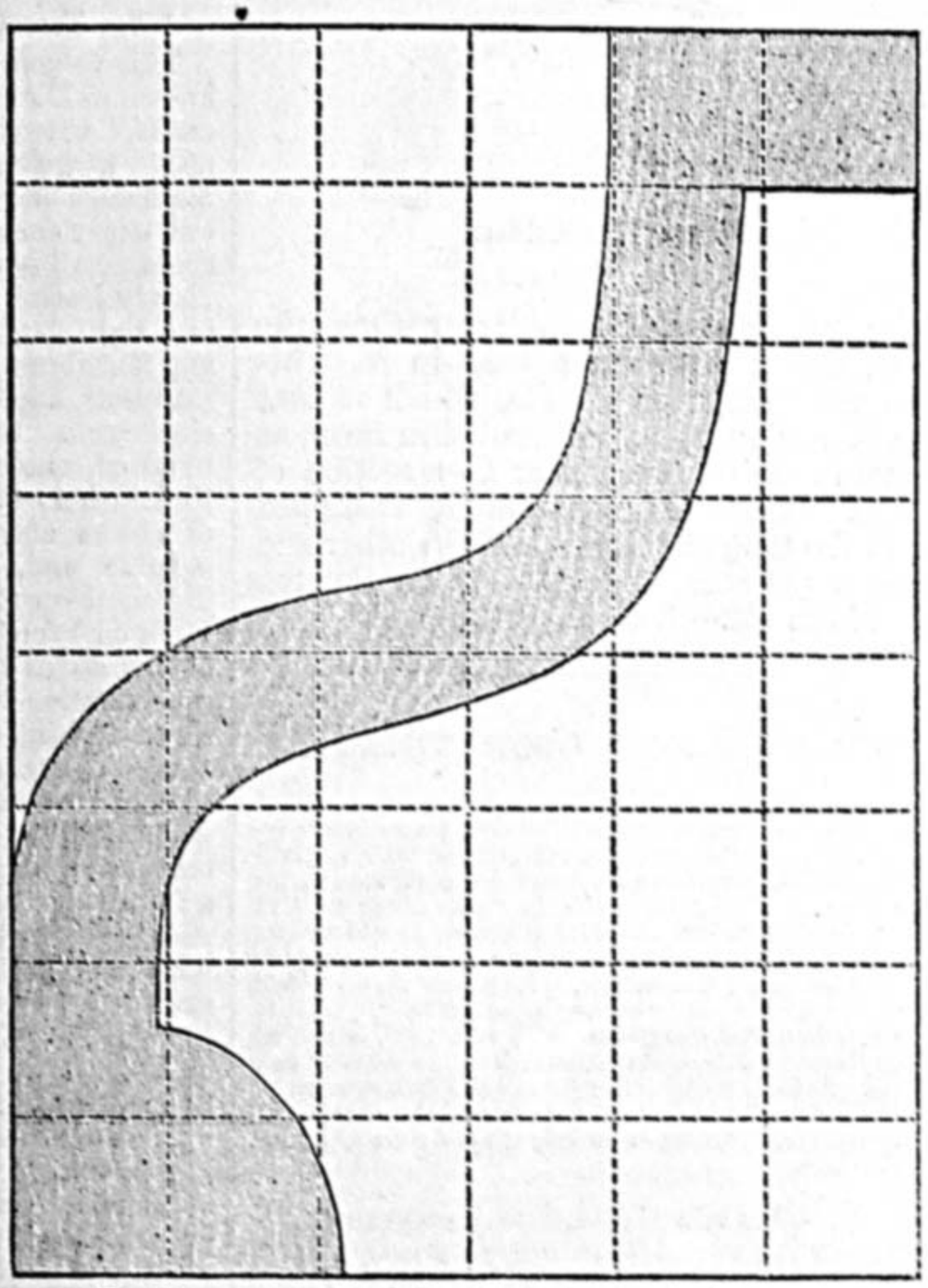


Fig. 5.

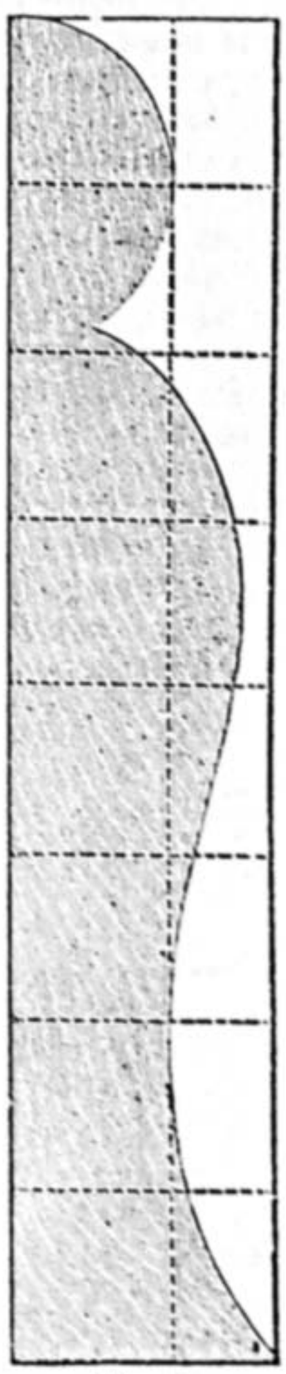


Fig. 6.

Fig. 7.

Fig. 5.—Pattern of Feet drawn to Half-inch Scale. Fig. 6.—Pattern of Shaped Upright carrying Hooks, Half-inch Scale. Fig. 7.—Design for Fretwork to drop into External Framing, Quarter-inch Scale.

I must leave the choosing of the lengths of these hooks to the maker, as he can then have the frames to rest at the angle he considers best.

Perhaps it would be best to have the hooks fastened on to the inside of the frame (not on to the outside, as I have shown), cutting away the fretwork to admit them. If this is done, the shaped piece of wood will keep its upright position, supposing it is merely hinged, whereas, otherwise, it would be at a slight angle.

For the hooks to hold the music in its place, read the instructions given by "O. B." lately, or else obtain four pieces of flat iron or brass, 3 in. long, bend the end of each at right angles for an inch, and file it round. They are then ready to fasten in.

I have drawn the fretwork to 3-in. scale; if the cutting of this is above the amateur, any fret cutter would do it for him; or if he did not like the design, and I confess there is nothing particularly new about it, as I have given my attention mainly to the job collectively, he might be able to choose a different pattern from the fret cutter's.

It will perhaps be observed that my drawings represent the article rather wider than it would be if made according to my measurements, but I think that if my description is followed out it will make as conveniently proportioned an article as possible. What I have said with regard to the enlargement of the parts shown in Figs. 5 and 6 applies equally in principle to the enlargement of the design for fretwork to drop into external framing, shown in Fig. 7, which is drawn to a scale of three inches to the foot, called also one-fourth scale, or quarter-inch scale. I have directed the attention of the reader to this pattern, and have said that he may, if he prefer to do so, substitute another pattern for it; this, however, must be in accordance with the size of our design, which, when enlarged into full size, is 16 in. by 10 in. To effect the enlargement, all that the fret-worker has to do is to make a fine tracing of the design, and divide this into squares, half an inch or a quarter of an inch apart, according to his pleasure, the smaller squares being used when the draughtsman has not sufficient confidence in his own skill and powers of reproduction to resort to the use of the larger squares. The reason for this will be apparent when I remind the reader that in the enlargement according to division into half-inch squares, the squares on the full-size drawing would be two-inch squares; but that, if the division of the design be effected by quarter-inch squares, the corresponding divisions on the full-size drawing would be one-inch squares. I have not penned these remarks for the guidance of professional workmen, but for amateurs and any who may find difficulty—and I believe there are many who do so—in working from drawings done to scale and requiring proportional enlargement.

MEANS, MODES, AND METHODS.

KORSHŪNOFF'S PINCE-NEZ SPECTACLES.

OF spectacles, so necessary to many people, the annoyance of their being always more or less wrong in their adjustment is trying and tiring. The Pince-nez is popular from the ready application of the bow-spring holding them on the nose, but in very many cases the plane of the glasses is not truly parallel with the plane of the eye surface; or, in other words, at right angles to the line of vision directed through the glasses. Figs. 1 and 2 show the difference of the planes, which so much depends on the formation of the nose. It is obvious that the plane of the glasses should be adjusted to the orbit of vision independent of the accidental formation of the nasal bones chancing to hold the spring grip of the glass frames rightly. M. Korshūnoff, a Russian engineer resident at Rue Chazelles, Paris, has patented spectacle frames by which their grip on the nose is entirely independent of the plane surfaces of the lens frame, as will be seen by sketches, Figs. 3 and 4.

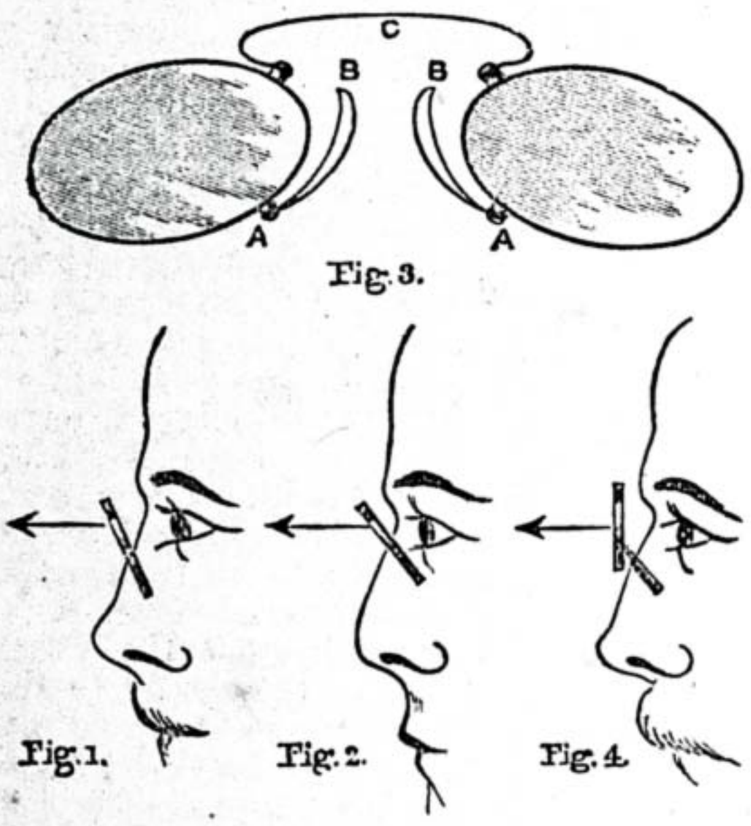


Fig. 3.

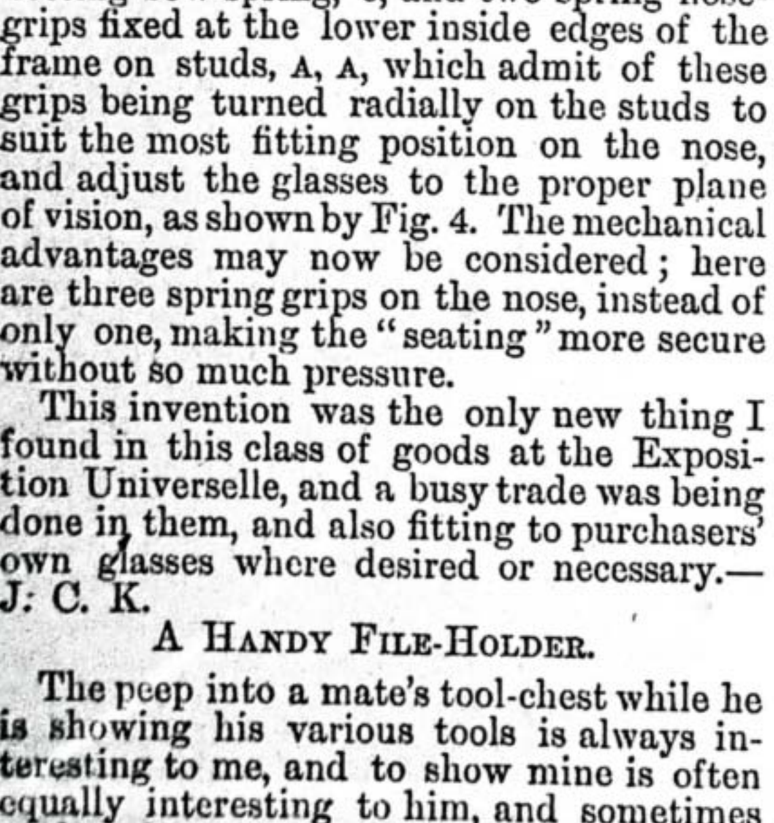


Fig. 1. Fig. 2. Fig. 4.

Figs. 1 and 2.—Difference of Planes of Glasses caused by form of Nose. Fig. 3.—Korshūnoff's Pince-Nez. Fig. 4.—Diagram showing Adjustment of Glasses to the Proper Plane of Vision.

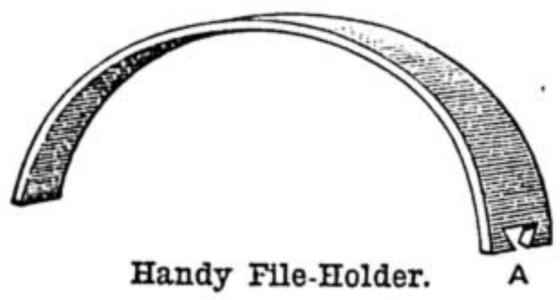
Fig. 3 is a Pince-nez with the usual connecting bow-spring, C, and two spring nose-grips fixed at the lower inside edges of the frame on studs, A, A, which admit of these grips being turned radially on the studs to suit the most fitting position on the nose, and adjust the glasses to the proper plane of vision, as shown by Fig. 4. The mechanical advantages may now be considered; here are three spring grips on the nose, instead of only one, making the "seating" more secure without so much pressure.

This invention was the only new thing I found in this class of goods at the Exposition Universelle, and a busy trade was being done in them, and also fitting to purchasers' own glasses where desired or necessary.—*J. C. K.*

A HANDY FILE-HOLDER.

The peep into a mate's tool-chest while he is showing his various tools is always interesting to me, and to show mine is often equally interesting to him, and sometimes evokes the remark, "I wish I had had such a tool, what time and trouble it would have saved me!" This was the remark upon showing a "file grip" which was new to him and his shopmates, and not having seen it in any other shop it may be new to some of your readers. Its use will be obvious by the sketch, showing how the whole length of the file may be used with considerable power with such hand-piece, while a handle would be in the way of using the heel of the file.

It is a bit of round iron bent to a hard-cornered curve about 5 in. long and 3 in.



Handy File-Holder. A

high; one end is made larger than the other, and a deep notch filed in it. This grips the "tang" of the file, which at that part is made slightly dovetailed in form, as shown in the illustration at A—a section of a tang. The notch corresponding is slipped on to the tang of the file, and the other end takes a pressure, bearing only on the top side of the file.—J. C. K.

OUR GUIDE TO GOOD THINGS.

*** *Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of WORK for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of any one who has a useful article for sale to obtain mention of it in this department of WORK without charge, the notices given partake in no way of the nature of advertisements.*

102.—GRANT'S GAS LIGHT REFLECTOR.

THE handy little article known as "Grant's Gas Light Reflector," made and supplied by Mr. J. T. Grant, Recreation Street, Bolton, is a useful appliance so made that it can be fixed on any gas-burner in a few seconds, and used for the purpose of reflecting and directing the light of the jet of flame issuing from the burner in any direction. Of course it will be understood that it is only intended to be used when there is a glimmer of gas, so to speak, proceeding from the slit or holes in the burner, as the case may be, and not when the gas is turned on to its fullest extent, and the flame, consequently, at its brightest. It is very simple in its construction. A band of metal ½ in. in width is bent into the form of a circle just about 2 in. in diameter, the ends of the band being bent outwards and brought together so as to form a short arm about ½ in. long projecting from the ring of metal already described. Before the band is bent, as described, an indentation is made lengthways along its central line, and this is utilised to receive and hold the edge of a small concave mirror, made apparently of copper and silvered. As soon as the metal ring has been brought round the reflector, two pieces of sheet metal, so cut that the ends, though parallel, are not in the same straight line, but have the connecting piece inclined to each at an angle of about 135°, are attached by means of a brass eye to the projecting part of the band, and on this eye, or hinge, the reflector can be turned upward towards the light, or turned back from it, as may be found necessary. The ends of this portion of the reflector are bent each towards the other in the form of an arc, thus being constituted a kind of clip to grasp the burner. The chief object with regard to its use as a reflector is to afford means of throwing a strong light upon the dial of a watch or clock placed at a distance of 8 or 9 feet, the rest of the room remaining in comparative darkness. This renders the reflector an article that should be prized by householders, artisans, night nurses, and others who may wish to note the progress of time as the hours run by, either through the long night or in dark winter mornings, and for the same reason it will be found useful by invalids or the wakeful. When the reflector is not in use, it may be bent back, as already said, without removing it from the burner. By attaching the reflector to a small stand, it may be made available for a small lamp. Its price is 1s.

103.—THE CLOCK JOBBER'S HANDY BOOK.

This volume forms the seventh of the series known as Lockwood's "Handy Books for Handicrafts," written by Mr. Paul N. Hasluck, as good a guide in all matters pertaining to mechanics and practical work as any man without experience, or with but a little experience, could possibly wish to have. "The Clock Jobber's Handy Book" is a practical manual on cleaning, repairing, and adjusting clocks and watches, and it embraces information on the various tools, materials, appliances, and processes employed in clockwork. It is illustrated with upwards of one hundred engravings, chiefly devoted to the illustration of tools, and the parts and mechanism of clocks and watches. It forms, in fact, a suitable and, it may almost be said, an indispensable companion to Mr. Hasluck's "Handy Book on Watch Jobbing," which also forms one of the series to which the volume now under consideration belongs. "The tools requisite for clock cleaning and simple repairing," says Mr. Hasluck, "are few and inexpensive, and but a small amount of practice will give the necessary manipulative skill. Thus clock jobbing offers an occupation easily acquired by those who have aptitude for mechanical subjects." To this it may be added that, in the eight chapters of which his book is composed, Mr. Hasluck gives sufficient information, clearly written and careful in detail, to pilot the way to successful operations on the part of those who may betake themselves to clock jobbing, either for gain or for amusement, under its guidance.

I have said that the subject matter of the volume is divided into eight chapters, and it may be useful to intending purchasers to show to what part of the subject each of these chapters is devoted. In the first, various forms of clocks are described; in the second, pendulums are considered as the controllers of the velocity of the going trains of clocks, and their regulation, and the various forms of pendulums in use are mentioned; thirdly, the escapements commonly used are noticed; and in the fourth chapter the attention of the reader is drawn to De Wyck's, German, and house clocks; in the fifth, the mode of examining and cleaning an eight-day clock is described; and in the sixth, the minutiæ and manner of repairing are carefully gone through; in the seventh, the treatment of French time-pieces is taken up; and in the eighth and last, lathes and turning appliances used by and useful to clock jobbers are reviewed. The price of this useful, well written, and well illustrated volume is 2s.

104.—DYSON'S BEDCLOTHES HOLDER.

It often happens, especially with children, that by their restless movements they will throw off the bedclothes that cover them, especially during the continuance of illness, and that colds in the one case and chills in the other are the inevitable consequences. To prevent this throwing off of the clothes, Mr. Alfred Dyson, 21, Till Street, Bury, has invented a very simple contrivance, which he calls a Bedclothes Holder. This consists of a piece of cord, very much like a piece of thin blind cord, with a wooden button about 1½ in. in diameter at one end, and a piece of wire bent into a fiddle-like form at the other. A loop is made in the middle of the cord, which is used to secure the appliance to the bedpost or rail at the bed-head. The button is then put under the clothes, and the clothes and button are thrust in a little lump through the broad part of the wire loop, and pulled down into the narrow part of the loop, by which clothes and button are securely held. The holder only costs 2d., and is well worth having.

THE EDITOR.

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SHOP:

A CORNER FOR THOSE WHO WANT TO TALK IT.

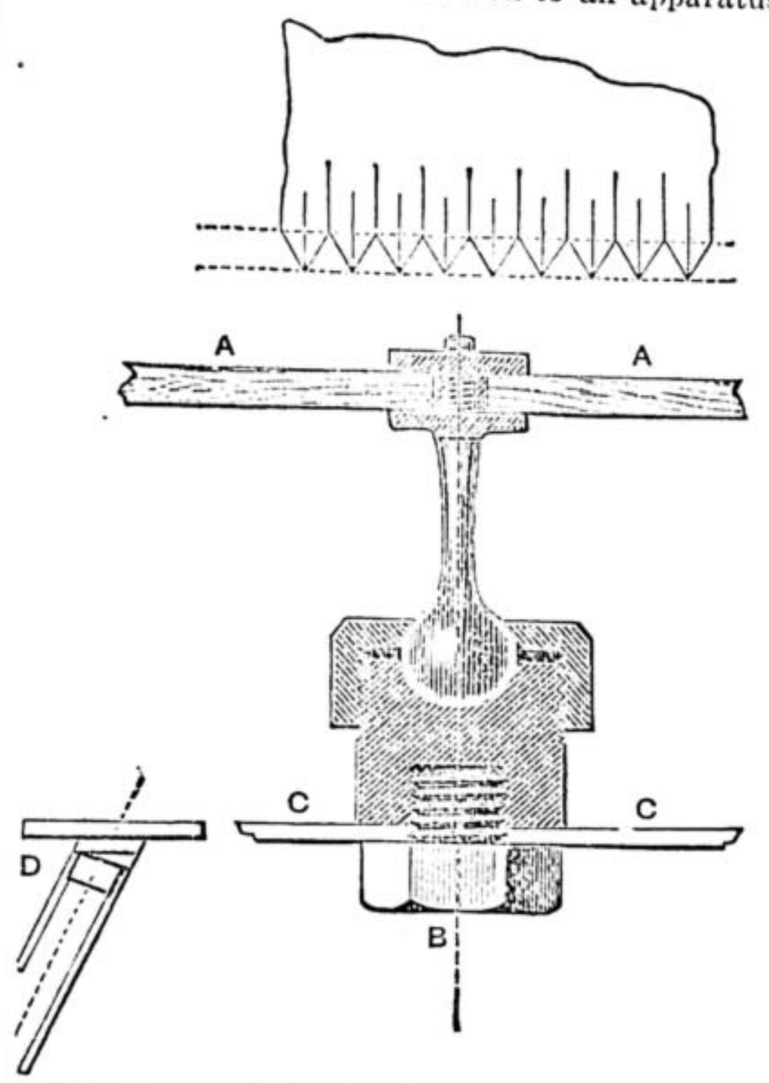
*** NOTICE TO CORRESPONDENTS.—*In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of* WORK *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—LETTERS FROM CORRESPONDENTS.

Remedy for Severe Cuts: Treatment of Bruises.—(WORK No. 26, page 411).—MEDICUS writes:—"I have been a subscriber to your valuable Magazine, WORK, since it started, and must thank you very much for the pleasure it has given me. I have followed with great interest most of its very useful and practical articles, being extremely fond of mechanical as well as of my professional occupation. I certainly think short paragraphs about how to treat the various little accidents to which every workman is liable, and from some of which most will have at times suffered, cannot fail to be of great use. But I should at least hope that these would be correct, and not likely to do more harm than good, or to put impossibilities down as facts. To begin with, a saw-cut wound would never heal quickly or without suppuration under the treatment you advise, and it is simply impossible for a finger cut off by a saw to be again united to the hand by any means whatever. A stiff-jointed finger is often more than useless to a workman, as it constantly gets in the way, and is therefore more likely to be injured again. I have amputated several entirely at the patient's own request alone for this reason. In the treatment of bruises the great thing is to arrest the extravasation of blood, and to keep that which is already extravasated from suppurating or turning into an abscess. This is generally done by rest, cold, or the application of some soothing astringent or absorbent lotion, and above all to keep the skin over the bruise whole, as once broken it is almost sure to suppurate. In your treatment you advise rubbing with a hot irritant or the application of leeches, which would probably just do the harm which is to be guarded against. I hope I have not spoken too strongly, but I write this trusting you will be rather more careful in the future to obtain accurate information."—[The WRITER of the notes entitled as above in "Means, Modes, and Methods" replies as follows to MEDICUS]:—"As to 'saw cuts,' with forty years' experience, I know they would heal quickly by the means proposed. Of course there would be suppuration; it is essential to eliminate the disorganised tissues. As to turpentine, its application is so general in railway and other shops that it is desirable its service in emergencies should be known to all. A finger cut off and replaced at once will grow, as I know from having seen only recently an instance. A foreman at a large sawmill was my informant respecting other instances. Bruises may be variously treated as suggested by the writer. Three ways are named. Turpentine is an absorbent. All are good, but for an emergency and generally, turpentine is the best I know of ready to hand. Many others, as arnica, might be named. In bad cases leeches are so important that the skin being opened for the blood to escape is far less serious than allowing it to remain and be absorbed into the system. I speak with confidence from more than forty years' experience of bruises, and serious ones, some to myself and family and friends, to whom the application of turpentine was the best remedy, and leeches saved from glandular inflammation and its attendant evils. I seek to serve those who suffer harm that may be alleviated promptly, and am convinced of its efficacy by many hundred cases having passed under my notice. Let those who have been harmed by it speak; let those who think differently advance something better. I, as well as your readers, will be thankful. Guessing as to probable results is not an answer to facts."—[Although it seems unlikely that a severed finger would be reunited to the hand from which it had been cut, I judged it as well to permit the notes to which MEDICUS takes exception to appear. I myself have known a case where the top of the thumb was cut off, bound on again, and reunited, but in this there was no severance of bone. I have reserved MEDICUS's letter until the reply from the WRITER of the notes in "Means, Modes, and Methods" could appear, and I now give letter and rejoinder together.—ED.]

Stencil Patterns.—MR. G. JONES (*East Cowes, Isle of Wight*), whose excellent stencil patterns were noticed in No. 27 (page 427) of WORK, writes:—"I should like it made known to the readers of WORK that instead of a small book of miniature designs, I send to intending purchasers, post free, a roll of full-sized designs, about 400, and price list per dozen, for selection; and if required I also send samples of cut stencils on approval, unless the selection is left to my judgment, when I do my best to give every purchaser satisfaction, and am quite willing to refund money if stencils are not approved."

Bicycle Camera Stand.—J. A. (*Liverpool*) writes:—"Seeing in your paper, WORK, an article on 'Camera Stands,' etc., I would like to bring to the notice of your numerous readers the stand which I have had made lately for myself. It consists of three legs, each of three pieces of thin brass tube, ⅝ in., ½ in., and ⅜ in. diameter by 15 in. long (connected when together by means of brass diminishers, but when not in use for the stand, they telescope into one another), screwed on to nipples soldered on at the right angle to a circular brass plate. The camera itself is fixed to an apparatus



Bicycle Camera Stand—A, Camera Bottom; B, Hexagon Nut; C, Brass Top Plate; D, Leg on top.

with a ball joint, secured when required by a hexagon nut, which is fastened on to the top by means of a tap bolt, as per sketch above. Thus, when the tripod is once fixed, the ball joint can be adjusted in any direction. I have found the apparatus for the camera very handy when mounted on the head screw of my bicycle by means of a stud screwed into it, and as for the stand, it is by far the stiffest and most substantial I have seen, and in addition is comparatively light."

Signboards, Construction of.—W. S. (*Goole*) writes:—"I think the writer of the article on signboards in No. 30 of WORK must have very little knowledge of the subject, and that his ideas of what a signboard should be are entirely and altogether misleading. I have made many signboards in my time, and have painted and written many more, being a sign painter for fifty years, and during that time have never, in my recollection, seen an oak one nor a pitch-pine one. These, I consider, are, especially the latter, the very worst woods of which to make signs. The best wood is good old yellow pine, or, if that cannot be had, any old, dead, well-seasoned white-wood. Why, if your sign were of pitch-pine, you could not keep the paint on it a single week if it were exposed to the sun. The resin would, especially if the board be painted black, liquefy and push off the paint. The cost of mahogany stands in the way of its general adoption, or else this is far superior to even pine. I have recently made one of Honduras mahogany, 17 ft. 6 in. by 2 ft. 2 in., in one piece. It had not a blemish of any description, and the price of the board at the timber yard was 26s. This board will 'stand' for generations. The thickness recommended by your correspondent is out of all reason. My boards I make of ½ in. and ¾ in. stuff—the thinner the better if properly made—and the way to make is as follows:—Place battens about 3 ft. apart, and do not screw or nail them to the board, but rebate the edges and fix loosely with buttons screwed, not too tightly, to the board. This plan will allow for expansion and contraction of the board. Leave the battens a trifle shorter than the width of board so that the cappings will not push off on contraction. Caps, mouldings, etc., I need not notice, as any skilled maker will know all about them. And now about jointing. Never use glue on a sign—use paint instead. If I have a board to joint, I prefer, instead of groove and tongue, a smooth or, as we Yorkshiremen call it, a slope joint with iron dowels. Let all battens, mouldings, caps, etc., be well painted before they are put together. Glue is a terrible enemy to all outside woodwork; its affinity for moisture keeps the parts always wet, and this is, according to long observation and experience, the sole cause of rot and decay in external woodwork. Who ever saw a door begin to decay in the middle of a panel, or a sash in the middle of a bar or frame—always at the joints? Why, the pins with which sashes are secured at the tenons slide out in damp weather of their own accord. Let me have all external woodwork put together with paint."

Subjects in WORK.—T. B. (*Portadown*) writes:—"I think your very interesting paper, WORK, must provide a long-felt want in many homes. At the same time you will pardon one who has worked with his hands on almost every sort of work from childhood, for suggesting that there are some things which it will save amateurs a vast amount of work and expense not to attempt, and which will cost an amateur even more for the materials than the finished article can be produced for. Now take, for instance, piano making. Is there a single reader of your paper likely to begin one, not to speak of the finished abortion? and will the music likely to be got from such an instrument not depopulate the unlucky neighbourhood where such an amateur may reside? In the name of common sense, give us articles that have a remote chance of application. All that kind of padding so prominent in some amateur papers on how to make a turning lathe without a lathe, how to make reflecting telescopes out of bullseyes and lids of tin cans, should be carefully excluded from WORK. There is a big future for your paper if the articles are written to suit the demand, and your subscriber wishes it well."—[WORK is for professionals as well as amateurs. It is not possible for me to cut down the list of subjects to be treated to those which an ordinary amateur workman may be disposed to undertake. It is quite possible for an amateur to make a piano, and a good one too. Men who make such things look rather to the end to be achieved and the pride of having done so rather than the expense to be incurred. I have known amateurs make good violins, and dispose of them at a remunerative price. It is possible to make a turning lathe without a lathe—namely, by rigging up a temporary substitute for one. I have never yet recommended the manufacture of reflecting telescopes out of bullseyes and lids of tin cans in this or any other publication, and I never shall. Lastly, the greater part of the papers that appear in WORK are written to demand. The difficulty is to satisfy popular craving.—ED.]

A "Multum in Parvo" Querist.—YOUNG APPRENTICE (*London, N.*) asks:—"(1) Can you answer the following questions:—(2) How to case-harden, clean and properly? (3) Should like to have a few more hints on cycle repairs and manufacture. (4) How to make a spoke-cutter? (5) The correct way to braze? (6) How can you calculate gearing? (7) Can you tell me a good book on engineering, or where I can learn it in London? (8) Where to get a good tire cement in a large quantity? (9) How to get a good enamel without baking? (10) What do you think will be the go in machines next season? I have taken in WORK for some time now, and am highly pleased with it."—[Ten questions on one piece of paper, and, metaphorically speaking, all in one breath! Please rewrite each question on a separate piece of paper, and then you will put it in my power to send each to the member of my staff who may be best able to answer it. You need not repeat the first and last questions. As to No. 1, I may at once reply, "Yes;" and to No. 10, I do not think anything at all about it, as I am not aware that any season sees a decided run on any particular class of machine.—ED.]

The New Water Glue.—F. C. W. (*Bradford*) writes:—"As you have said you would like to have the experience of subscribers who have used the new water glue, I beg to say I have used it a good deal for all sorts of work, and find it exceedingly valuable; for the smaller joints in cabinet work it cannot be surpassed, as it makes a perfect joint. This is the best liquid glue I have seen, and it has the valuable property of being waterproof in addition."

Combination Bedroom Suite.—T. B. R. (*Hull*) writes:—"Being a great admirer of WORK, and an amateur woodworker myself, I should like to make, with your kind permission, a few criticisms and observations upon the 'Combination Bedroom Suite,' by Mr. Scott, in No. 26 of WORK. I hope Mr. Scott will not be offended by my remarks, as I admire his ingenuity in his contrivance. My first objection to the suite is the unsightly appearance the wardrobe door would present when closed, it having to be hinged on the outside, thus showing an ugly angular strip the whole length of the door. The projection at the back of the looking-glass is also unsightly. Now what I would suggest as improvements are that the wash-hand basin should be fitted in a drawer in the compartment where the soap dish, etc., are shown—it would thus be out of the way, and not show when not in use. There would also be room in the angles of the drawer for soap dish and brush tray. This arrangement would do away with the door having to open at the side, and I would suggest that the wardrobe closet be made 10 in. or 12 in. wider, and the door open in the front and have a looking-glass panel. If this were done it would do away with the looking-glass shown by Mr. Scott, the fastening for which is so high up (6 ft.) that many people would have difficulty in opening it. The three cupboards at top might then be formed into two, and would be infinitely more useful than at present arranged. The cupboard and drawer at the base should both open in the front, and be either two drawers or two closets of equal length, and if made a little higher one of them might hold the water jug or other utensils used to contain water, and the other necessary conveniences of a bedroom, provision for which does not appear to have been made. One other observation and I have done, and

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that is that the thickness of the wood used in the construction (at least of the styles of the panels) should not be less than 1 in. thick, and not ½ in. as recommended."

Band Saw Machines and Band Saws for Sweep Work, etc.—A. R. (*Scorrier Saw Mills*) writes:—"There was a time when the jigger was considered a valuable little machine for sweep work, etc.; but when compared with the band saw machine of to-day it is left in the background. A good band saw machine in a factory where an amount of sweep work is to be done cannot be too highly esteemed. I say a good machine because, as in all other things, there are good and bad. A good machine for such work I consider should be heavy, that is, the main frame should be heavy and strong, and the spindle or shaft on which the bottom wheel is keyed should be at the base of the machine;

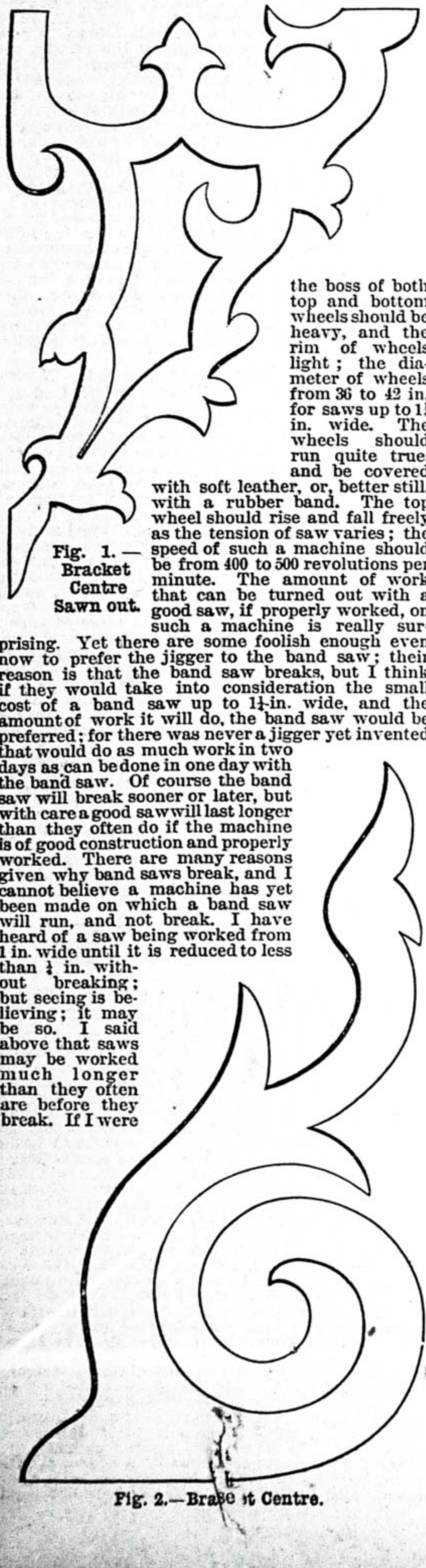


Fig. 1.—Bracket Centre Sawn out.

the boss of both top and bottom wheels should be heavy, and the rim of wheels light; the diameter of wheels from 36 to 42 in. for saws up to 1¼ in. wide. The wheels should run quite true, and be covered with soft leather, or, better still, with a rubber band. The top wheel should rise and fall freely as the tension of saw varies; the speed of such a machine should be from 400 to 500 revolutions per minute. The amount of work that can be turned out with a good saw, if properly worked, on such a machine is really surprising. Yet there are some foolish enough even now to prefer the jigger to the band saw; their reason is that the band saw breaks, but I think if they would take into consideration the small cost of a band saw up to 1¼-in. wide, and the amount of work it will do, the band saw would be preferred; for there was never a jigger yet invented that would do as much work in two days as can be done in one day with the band saw. Of course the band saw will break sooner or later, but with care a good saw will last longer than they often do if the machine is of good construction and properly worked. There are many reasons given why band saws break, and I cannot believe a machine has yet been made on which a band saw will run, and not break. I have heard of a saw being worked from 1 in. wide until it is reduced to less than ¼ in. without breaking; but seeing is believing; it may be so. I said above that saws may be worked much longer than they often are before they break. If I were to give all the reasons stated by makers and others why band saws do break, I think I should be encroaching on valuable space, but the following, in my opinion, are two or three of the chief reasons why they break oftener than they otherwise would, when worked on a good machine.

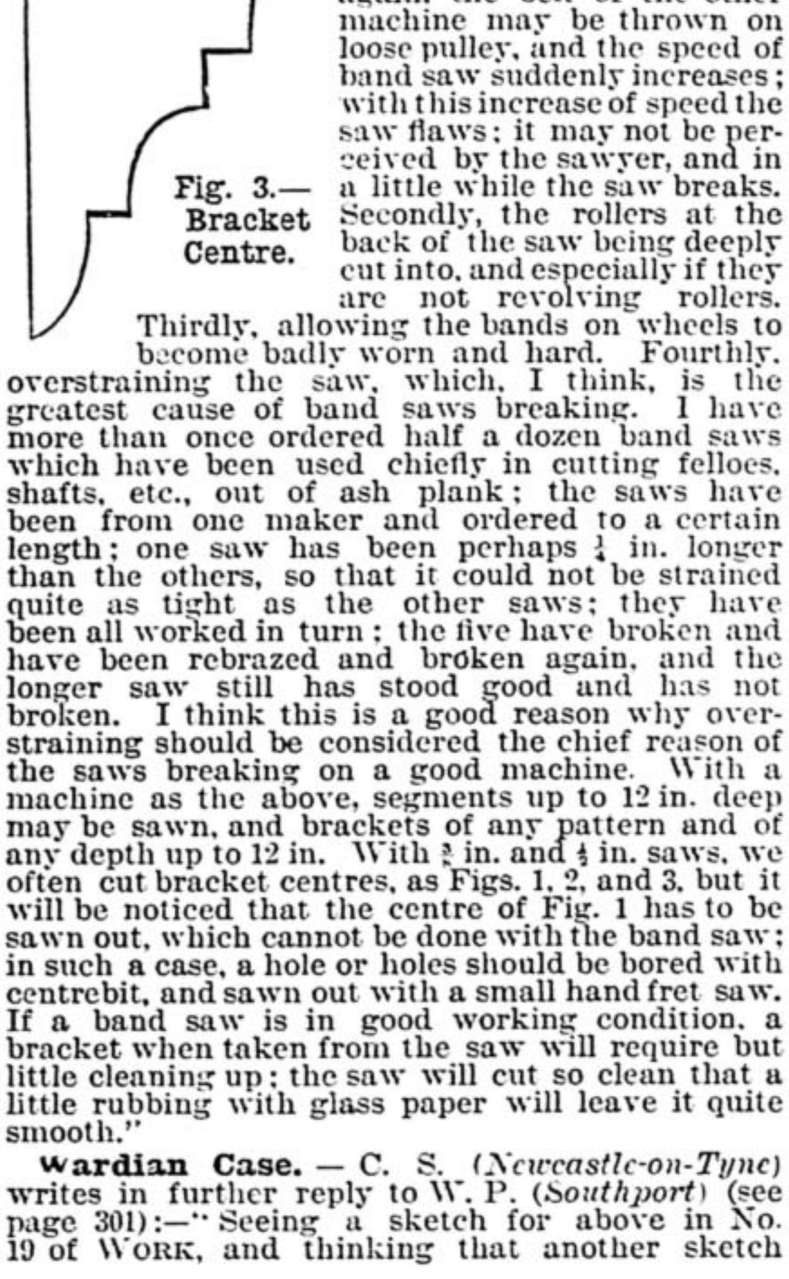
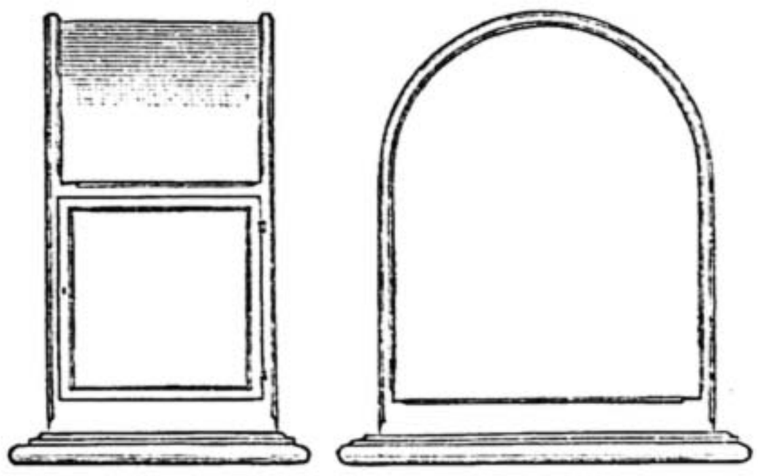


Fig. 3.—Bracket Centre.

First, variation of speed: a saw may be running its proper speed, another machine may be set to work, and the speed all at once decreased; the sawyer still tries to feed the timber to the saw quite as fast as before; he overcrowds the saw again, the belt of the other machine may be thrown on loose pulley, and the speed of band saw suddenly increases; with this increase of speed the saw flaws; it may not be perceived by the sawyer, and in a little while the saw breaks. Secondly, the rollers at the back of the saw being deeply cut into, and especially if they are not revolving rollers. Thirdly, allowing the bands on wheels to become badly worn and hard. Fourthly, overstraining the saw, which, I think, is the greatest cause of band saws breaking. I have more than once ordered half a dozen band saws which have been used chiefly in cutting felloes, shafts, etc., out of ash plank; the saws have been from one maker and ordered to a certain length; one saw has been perhaps ¼ in. longer than the others, so that it could not be strained quite as tight as the other saws; they have been all worked in turn; the five have broken and have been rebrazed and broken again, and the longer saw still has stood good and has not broken. I think this is a good reason why overstraining should be considered the chief reason of the saws breaking on a good machine. With a machine as the above, segments up to 12 in. deep may be sawn, and brackets of any pattern and of any depth up to 12 in. With ¾ in. and ½ in. saws, we often cut bracket centres, as Figs. 1, 2, and 3, but it will be noticed that the centre of Fig. 1 has to be sawn out, which cannot be done with the band saw; in such a case, a hole or holes should be bored with centrebit, and sawn out with a small hand fret saw. If a band saw is in good working condition, a bracket when taken from the saw will require but little cleaning up; the saw will cut so clean that a little rubbing with glass paper will leave it quite smooth."

Fig. 2.—Bracket Centre.

Wardian Case.—C. S. (*Newcastle-on-Tyne*) writes in further reply to W. P. (*Southport*) (see page 301):—"Seeing a sketch for above in No. 19 of WORK, and thinking that another sketch



Wardian Case.

might be of use to some of the readers of WORK, I have enclosed one, which is a copy of a case which I fitted up for my own use. It would be best made of oak or teak. The side glass is in one piece, with small doors in each end for working the interior. It would also need a zinc tray two inches deep to form the bottom. If desirable, I would be glad to send details and full particulars for any of our readers."

Cheap Hearth for Smithing.—A. H. (*Wolverhampton*) writes:—"In reply to A. S. (*Liverpool*) (see page 414) in reference to my reply to BELLOWS (*Gloucester*) in page 302, with respect to a machine for a current of air, I beg to submit the following:—(1) In the construction of a cheap hearth for use with the machine. The hearth will be about 3 ft. high. A. S. will want some sheet iron (20 gauge is about the right thickness). Cut a circular piece of iron 2 ft. 7½ in. in diameter, then a strip (for the sides or rim of the hearth) 4 in. wide and 8 ft. long. Turn up all the way round the circular piece ¼ in. Rivet the long strip together first, then the bottom piece to the strip, as in Fig. 1. Then you will want four lengths of rod iron 1 in. thick. Flatten the top, and drill a hole through for riveting. Then turn the flattened piece back, as in Fig 2. Do this to the four pieces (each to be 3 ft. in length). Rivet these on the bottom. Connect a piece of rod iron to the four legs, as in Fig. 3. (2) The tue-iron or blast pipe. If A. S. wants one for the water to circulate it will be more trouble than one with a plain nozzle. However, as he asks for the mode of constructing a tue-iron for water, I will explain it. The iron, which should be cast, is shaped as in Fig. 4. A. S. had better buy one ready-made. He will also be provided with the water pipes. About 6 in. long will be the best size for the hearth. The pipe at the top must be connected with the bottom of a tank or tub, and the one at the bottom must come up to the top of the tub. The water goes down pipe A. The water becomes heated, and then the steam forces it back up pipe B into the tub again. (3) As to the fan. One 10 in. in diameter would answer A. S.'s purpose; the box to be 1 ft. in diameter. The mode of working to be as follows. The fly-wheel 2 ft. diameter, and the fan pulley 3 in. A the pipe from the fan; B the exhaust water pipe going over to the top of the tub; C feeding water pipe; D tue-iron; E treadle; F crank; G fan box; H H supports for fan; I cross bar from one leg to the other. Four of these will be required."

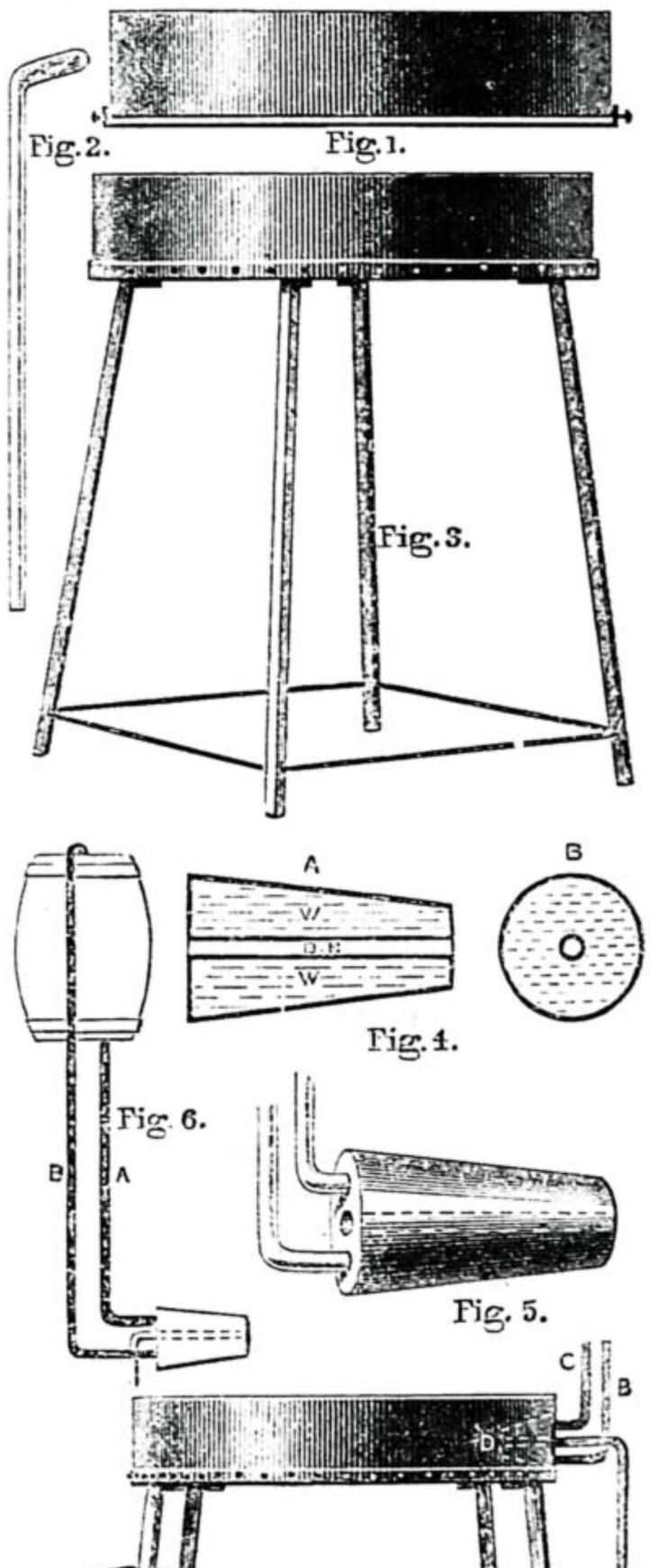


Fig. 2. Fig. 1.

Fig. 3.

Fig. 4.

Fig. 6.

Fig. 5.

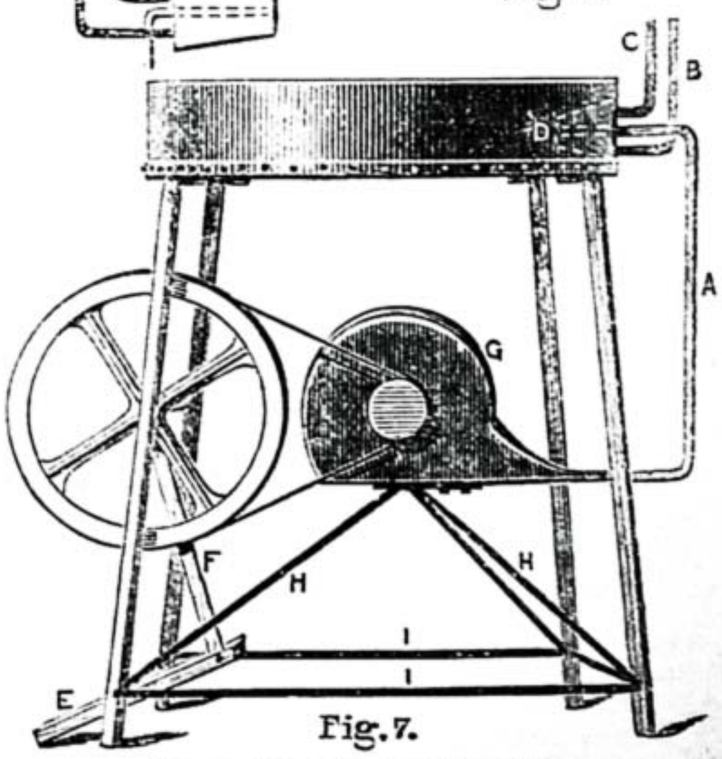


Fig. 7.

Cheap Hearth for Smithing.

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Learning a Trade.—PADDY writes in reference to EXCELSIOR's question (see page 413):—"I can point out the only way by which EXCELSIOR can live and learn a trade at the same time. He must get on at some good shop as painter's labourer, and make up his mind to be *excelsior* in the future, and he is sure to make himself a good tradesman. Books are no use unless you have ocular demonstration at the same time, and most painters of to-day have begun as above, though they may not have liked the discipline. At the same time, like myself, he can keep his eyes open on the other trades with a view to jobbing on his own account. This also is decidedly not approved of, but every right-minded man wants to be independent."

Classes in Carpentry.—B. R. C. (*East Finchley*) writes:—"I think AMATEUR (*Bayswater*) (see page 302, No. 19) could obtain, as I did, 'some elementary knowledge of carpentry' at King's College. I belonged, some eight years ago, for six months, to an evening class (which, doubtless, still exists) which met there two evenings a week from half-past six to nine o'clock, and there learnt to make some eight or nine different joints, and made myself a large bench and tool-box, which are now, after constant use, as strong and sound as ever. The knowledge there obtained, combined with pretty constant practice in spare moments at home, has enabled me to make in workmanlike manner a variety of useful, strong, and ornamental articles. The fee, I believe, speaking from memory, is £2 a term of three months. You receive, sir, so many commendations upon the manner in which you conduct WORK, that I will refrain from adding mine, except on one point which I have not seen referred to yet. It is your light and dexterous touch in letting down the grumblers, as exemplified on page 300 in No. 19, in your reply to R. B. R.'s effusion; it is beautiful."

Classes in Handicraft.—F. S. (*Exeter*) writes:—"In answer to H. N. (*Kingston-on-Thames*), allow me to give my little experience with a night class of drawing for working-men and youths. Having received much advantage in my trade as brass worker through a knowledge of drawing obtained at Severn Street Night School, Birmingham, I feel it my duty to encourage others to try that art, and show in a practical way I mean to do so by starting a penny night class for drawing, providing everything necessary. First business, to get a room, free if possible, with light, and at last the Rev. G. Davis, of Trinity Church, in this city, allowed the use of a room, and provided gas and firing *free*. Second, I have to obtain drawing boards, T squares, compasses, rubbers, pins, paper, and pencils, with a black-board and chalks. These cost me at the rate of £2 15s. per dozen set. On the first night I invited some of the students to help in the work, and right willingly was it taken up, these to come half an hour before time to prepare room, sharpen pencils, etc. And here let me say I only lost three pencils in three months. We went on so successfully—increased our numbers to double what we started with—that I could not admit more owing to expense of tools, etc. Only gave up the class owing to lease of premises running out. My generous donor had to give up. I am thinking of commencing again in the winter months, and having one night per week for repoussé brass work, if I can get some monetary help to start. Once start, that is all you require. I wish H. W. every success in his work, and am willing to give any advice I can to help him in his good work."

Model Yacht Building.—OXYGEN writes:—"I see that in the reply to G. H. (see page 269), *re* 'Model sailing vessel,' you say that the writer would naturally like to know the taste he has to suit. As I am an ardent model yachtsman, will you allow me to make some suggestions? I, and probably many other readers of WORK, should like an article on the designing and building of racing model yachts, such as are sailed at Clapham and Kensington; not show models for glass cases and such purposes. Such an article I should suggest might be followed up by an article on racing model steamers, such as one sees in connection with the Manchester Model Yacht Club. I am sure, with the aid of WORK, the designing of such would become as popular among amateur mechanics in London as it appears to be in Manchester. No hobby could be more instructive in the mechanical line, as it would call into play both the mental and physical capabilities of the amateur shipbuilder."

The New Waterproof Liquid Glue.—J. B. B. (*Bradford*) writes:—"Your request to your readers to report their experience with the above leads me to write to you. When I first tried it in our pattern shop I formed a poor opinion of its adhesive qualities, but further experiments have caused me to change my opinion. If the joint is clamped up hard, and the glue forced from between the joint, the result is failure; if the joint after being coated is simply placed together and left undisturbed to harden, the result is a good, tight, hard, and thoroughly waterproof joint. I should like it to set a little quicker, but doubtless the makers will improve the glue as time goes on. Meanwhile I have no hesitation in recommending its use in the house or the shop. It is a practical and much wanted improvement in the glue line."

Machine for Current of Air.—A. T. W. writes in reply to BELLOWS (*Gloucester*) (see page 302):—"In No. 12 of WORK, I saw a letter from BELLOWS (*Gloucester*), asking for a method of making a machine to give a constant current of air. I saw one some time ago, and have represented it here as clearly as I can, to give BELLOWS and others some idea how it is constructed. It is, however, a somewhat clumsy affair to use, and unless well made is apt to get out of working order. Fig. 1 shows it in perspective. Figs. 2 and 3 are two sectional views. H (Figs. 1 and 2) is a small

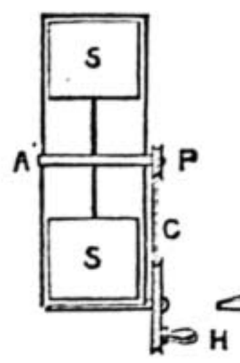


Fig. 2.

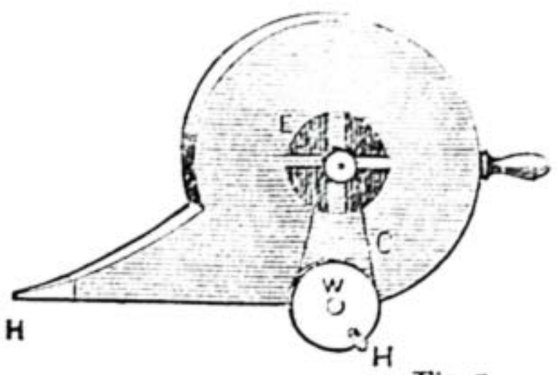


Fig. 1.

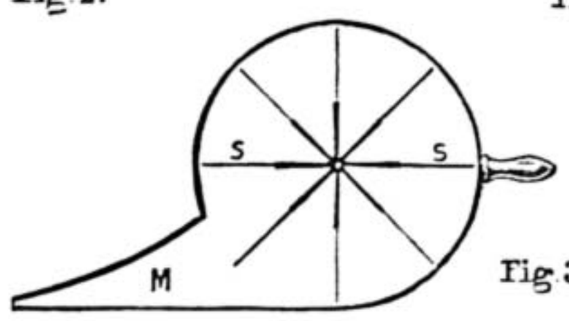
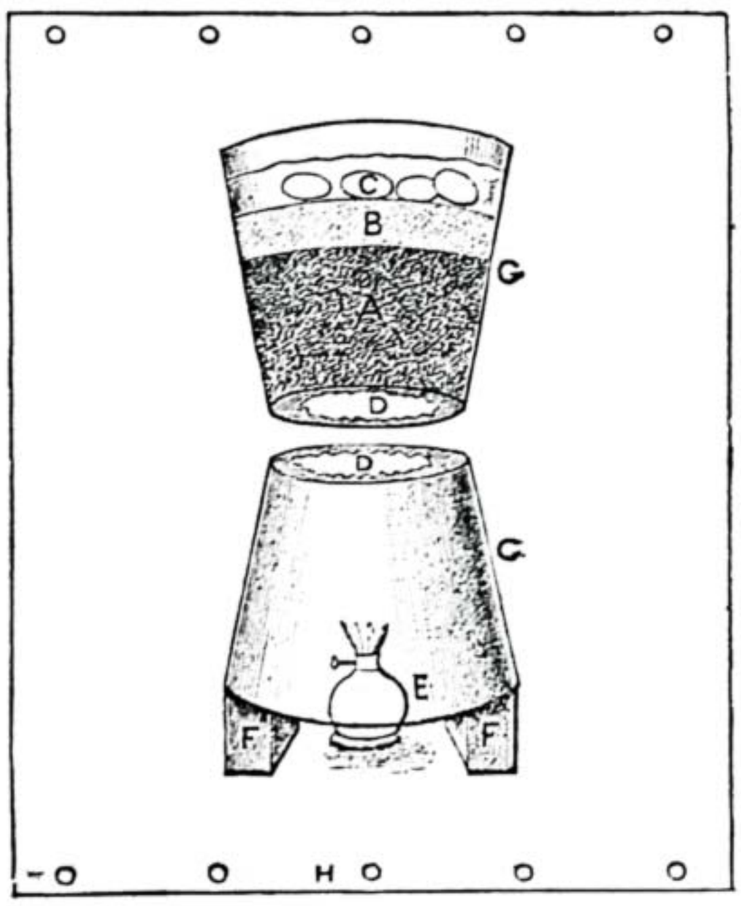


Fig. 3.

Machine for Current of Air.

handle which turns the large wheel, W (Fig. 1), round which a cord, C, passes round the small wheel, P (Figs. 1 and 2), which turns the small sheets of metal, S S, which are eight in number, and are fastened to the axle, A (Fig. 2), by pieces of wire, the whole of which revolves inside the case, and blows out a current of air at M (Fig. 3). A space should be left at E (Fig. 1) for the entrance of the air, the axle being supported by two cross pieces. The smaller details may be seen by reference to the figures. The one I saw was made of japanned tin, and seemed to work very well, but I should think one might very easily be made out of wood and cardboard."

Simple Incubator.—W. L. (*Kingsland*) writes:—"In answer to B F. (*Liverpool*) (see page 302) how to make a simple incubator, I send a rough sketch of one easy to make, will work well, and cost next to nothing. All that is wanted is two large-sized garden pots, piece of tin, small lamp, two bricks, fine sand, some flannel, and box large enough to



Simple Incubator—A, Sand; B, Flannel; C, Eggs; D, Tin; E, Lamp; F, Bricks; G, Pots; H, Ventilators round Box.

hold same when put together. To make, break out bottom of pots; cut tin to fit in bottom of one at D; then half fill with fine sand (A), top of sand some flannel (B), on the flannel your eggs, on eggs some more flannel. For bottom pot place your two bricks in bottom of box, so that your pot rests on them; under pot place your lamp. Then place other pot with sand in on top of this, and your incubator is complete."

Step Chair.—RALPH E. SCORAH (*Urbana, Ohio, U. S. A.*) writes under date of September 2nd:—"In reply to W. W. W. (*Nottingham*) (see page 270), I enclose a cut of a chair which can be changed into a step-ladder. This chair is made and given away to every purchaser of a butt of plug tobacco. I do not think it is patented here. Please publish this with full name in 'Shop.'"—[I have much pleasure in complying with MR. SCORAH's request. I do not engrave the drawings of step-chair in its two forms of chair and step-ladder, but I can assure W. W. W. (*Nottingham*), and any other readers of WORK who may be willing to buy a "butt of plug tobacco" in order to get the chair, that it is a very good-looking piece of furniture. Unfortunately MR. SCORAH leaves us in the dark as to the weight and price of the quantity of tobacco named, and without these particulars it is unlikely that even W. W. W. (*Nottingham*) will respond. I trust MR. SCORAH will forgive my ignorance on this point, but the United Kingdom is not yet a tobacco-growing country, though it is trying to be, and so "tobacco weight" does not yet figure in our "tables of weights and measures."—ED.]

Quick Drying of Gelatine Negatives.—E. B. (*Liverpool*) writes:—"In WORK No. 29, page 162, I observe a reply given to a correspondent on the above subject which I venture to say is hardly correct. Benzine will not do instead of spirit to dry a negative, neither will sulphuric ether. Spirit dries the negative quickly solely by the powerful attraction which it possesses for water, acting like liquid blotting paper as it were. Neither benzine nor ether possesses this attraction, and were a gelatine negative soaked in benzine for a week it would at the end of that time contain as much moisture as when put into it. Expense can scarcely apply to articles so cheap as methylated spirit and benzine, the difference in price being only about 2½d. per pint.

Model Locomotive.—W. T. (*Blairgowrie*).—This subject is receiving consideration, and will without doubt be taken up and thoroughly treated in WORK in due time.

Gasoline.—D. M. I. (*Portsmouth*) writes:—"For the information of your correspondent, J. McW. IERNUS (*Tarbert*) (see page 469, No. 29 of WORK), I think he could obtain gasoline from Messrs. Sugg and Co., Vincent Street, Westminster, in small quantities. It is one of the lighter paraffins, and is used for making air gas to supply mansions too great a distance away from gas works to be supplied therefrom."

New Water Glue.—J. M. N. (*Bradford*) writes:—"In a recent number of your valuable paper called WORK you invited subscribers to give their experience with the 'new waterproof liquid glue.' My experience with this article (which is over twelve months') is that it is a most excellent 'waterproof liquid glue,' and I believe that it will do all that is claimed for it by the makers."

The New Water Glue.—R. W. (*Shipley*) writes:—"Seeing your article on the new waterproof glue made by the new Glue Company, Shipley, and your request for the experience of those who have tried it, I have much pleasure in stating for the benefit of your readers that I consider the glue invaluable to amateurs; for model yacht building it is a perfect boon, insuring a tight boat, and much facilitating the building process; in fact, by the use of the glue the most unskilled builder is insured a tight craft. I have also used the waterproof glue with success for domestic purposes, repairing furniture, and even glass and china, and consider it invaluable for every household, on account of its handiness and other qualities. It requires rather different treatment in use to the ordinary glue, that is, the joint must not be rubbed, but after being glued simply requires gentle pressure to insure success."

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Tools for Hand Turning.—BODGER.—Yes, you require nothing but the chisel or gouge and the T-rest for turning such things as egg cups: turners' chisels and gouges are kept at most ironmongers' who sell tools at all, and cost about a shilling each. You should inquire for a turner's shop, and give him a shilling to give you a lesson; that would teach you more about the way to hold a gouge for hollowing out an egg cup than pages of description.—F. A. M.

Wood for Cheval Screen Escritoire.—F. J. (*Bristol*).—While fully appreciating your desire to be economical in the raw material wherewith you propose to construct the cheval screen escritoire that appeared in WORK of June 15th, yet I am strongly of opinion that it is false economy to waste good joinery upon inferior stuff, only to find afterwards that all the time and care lavished is, to a great extent, thrown away. Pitch pine would be, no doubt, cleanly to work, and not unpleasant in its effect. If you decide to use it, I should advise you to stain it black and polish it, and if decoration of the panels by inlay or carving is impossible (and with pitch pine it would be practically so), then to try an odd yard of Japanese gold leather paper, or lincrusta, and use it on the panels. Pieces the size you require would cost but a few pence at any good decorator's, for such scraps are sure to be left over in important jobs. The form is quite unsuitable for veneer, and I should strongly advise you not to attempt it on a structure so complex as the one quoted. American walnut is cheap, and you can often buy old mahogany at a second-hand shop, in the shape of some piece of furniture damaged past repair, that would yet cut up into such a thing as this. If you dislike black a good finish might be made with Aspinall's enamel in a dark peacock blue, or even a sealing-wax red. Sequoya wood is as cheap as pitch pine, very pretty, and easy to work, but perhaps too soft to be suitable for an escritoire. Bearing in mind that accidents in the neighbourhood of an ink bottle usually leave lasting results, I think one may come back to ebonised wood as the most satisfactory, especially as certain parts, for example, the door

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frames and the projecting feet, can be cut of harder wood. Your personal thanks I must not overlook, although modesty forbids me to accept them fully. Yet to know that one's efforts are appreciated, and that the pleasure of explaining results in the pleasure of being understood, is an experience that, however often it comes (and the correspondents of WORK are a kindly-disposed set), always comes with a fresh feeling of gratification to yours very faithfully,—J. G.-W.

Books on Plumbing.—SEMPER IDEM (*London, W.*).—You will find the following to be good books on the subject you mention:—"Sewer Gas, and How to Keep it Out of Houses," by O. Reynolds (Macmillan & Co.), 1s. 6d. "Bad Drains, and How to Test Them," by R. H. Reeves (E. and F. N. Spon), 3s. 6d. "Plumbing," by W. P. Buchan (Lockwood), 3s. 6d.

Polishing Cutlery. — C. L. B. (*Tunbridge Wells*).—To repolish cutlery, you will require three wheels about 8 in. diameter, and 2 in. to 2½ in. wide, the edges covered with buff leather. If in possession of a lathe you can use that as a means of revolving the wheels, but it is not advisable to use a good lathe for this purpose, as the grit and dust damage the bearings. If you are going to make a regular thing of polishing, then rig up a proper frame, something like the knife-grinders travel the streets with. The wheels should have a square hole in the centre so as to all fit on one square spindle; they can be keyed on or fixed by means of pins driven through, or holes drilled in the spindle each side of the wheel. Use with the first wheel No. 0 emery and oil, till all scratches and marks are taken out, then use wheel No. 2 with crocus and oil, and polish up on No. 3 with dry crocus or rottenstone, revolving the wheels from you, and working at a good speed.—R. A.

Small Electro-Motor.—J. C. (*Shipton, Yorks*).—I gather from your letter that you wish to revolve a wheel of life, or Praxiniscope, by means of a small electro-motor, worked by a current from a quart Bunsen battery. As you got the battery from Mr. Dale, he will also advise you respecting a motor to be driven from it, if you write clearly, and tell him just what you want. But do not ask for a "Magneto-Morter," as you have in your letter to me. Tell him you want a small electro-motor such as is used in revolving vacuum tubes. It will cost about 15s. As he is a maker of optical instruments, he will also give you the price of a Praxiniscope or wheel of life.—G. E. B.

Electro-Gilding and Electro-Plating.—LEARNER (*Manchester*).—The best book on the subject for a "beginner" or a professional workman is "Electro-deposition," by A. Watt, published by Crosby Lockwood & Co., price 12s. 6d. This you may get for 9s. from a discount bookseller. Be sure you get the latest edition. A cheaper but good book is "Electro-plating," by J. W. Urquhart, published by the same firm, price 5s.—G. E. B.

Electro-Plating.—C. H.—Kindly see reply to LEARNER (*Manchester*), respecting the best book for your purpose. I may say, however, that the subjects you name will be fully treated in WORK in a manner easily understood by everybody able to read. I note with pleasure what you say about boy readers of WORK. It will be always (I hope) my chief concern to so write my articles as to make them quite clear and readable to boys and young men. I write for them specially, and have them always in my mind when writing for WORK. But the boys and young men and apprentices who now read WORK will be, I trust, some day, professional men, and I must write so as to anticipate that time also.—G. E. B.

III.—QUESTIONS SUBMITTED TO CORRESPONDENTS.

Steel and Florentine Bronze.—J. L. writes:—"Can any reader give me particulars for steel and Florentine bronze for brass work (gaseliers and gas brackets)? I can work green lacquer, but know nothing of these newer colours."

Riveting China and Glass.—F. A. J. (*Canonbury*) writes:—"Can any reader tell me how china and glass riveting is done? How the holes are drilled? Whether the rivets can be purchased or are made at the time, and how they are secured? It seems to me probable that it is a simple process well within the capability of most men, and would often save the destruction of a useful piece of china, and if the information could be given in 'Shop' might be useful to others besides myself."—[I shall be glad to receive a paper on the subject describing the peculiar drill that is used, how to drill the holes, and how to insert the rivets, from any person competent to write on the subject.—ED.]

Barnes' Foot-Power Scroll Saw.—REMINGTON writes:—"If any reader of WORK has tried or seen working one of Barnes' American Foot-power No. 7 scroll saws, I should be thankful if they would give their opinion of same—as to what thickness it will cut easily, etc.—as I am in want of one for practical workshop use. I don't want a toy. Any particulars as to same would be thankfully received."

Harp.—J. K. (*Glasgow*) writes:—"Would any reader inform me how to construct a harp? I should be much obliged."

Small Pump.—W. R. S. (*Brixton*) writes:—"Would anybody be kind enough to give me instructions for making a small pump capable of lifting about a third of a pint of water at each stroke, and where to get castings for same?"

Book on Brushmaking.—BRUSH (*Tipton*) writes:—"Can you recommend a book on common brushmaking? If not, I should be glad of any information on the subject in 'Shop.'"

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Cement for Billiard Slates.—W. G. writes in reply to CEMENT (*Cork*) (see page 382):—"Gold size and litharge, worked up into a stiffish putty, will answer the inquirer's purpose. It will set as hard as the slate, and be unaffected by heat."

Illuminating.—H. T. L. (*Tufnell Park, N.*) writes in reply to H. C. (*Lincoln*) (see page 318):—"As I have seen no reply in WORK to the above, I venture to make a few suggestions. Presumably H. C. is about to illuminate a testimonial, or possibly write a missal. You do not specifically state which. Rub your parchment or vellum with pounce, and having stretched it as usual, proceed to work. No more suitable colours than those contained in moist pans can be used. If you mean by their not being brilliant that they have not sufficient gloss, add a little gum water together with a little liquid ox-gall; the latter causing the colour to flow more evenly on the somewhat ivory-like surface of the vellum. The colours I use are, viz.—smalt, French blue, cobalt, and sparingly cerulean, carmine, rose madder, scarlet and purple lakes, and vermilion, emerald and oxide of chromium, deep and pale cadmium, lemon yellow and aureolin, vandyke brown, lamp black, and Chinese white. Surely you can obtain a brilliant colouring with these. Don't mix them much, mixing always destroys brilliancy. Use for gilding gold leaf with a gilder's cushion and short-haired tip. I use both deep and pale gold, the pale on raised parts, such as mouldings, etc., the deep on the flat parts to give some indications of shadow. To answer your question and reply to your remarks properly would take up too much space in this column. Procure Winsor & Newton's 'Manual of Illumination' and 'Companion' (1s. each). The style they indicate is the purest and the instruction among the best."

Insurance of Tools.—F. J. (*Kidderminster*) writes:—"I see in No. 27 of WORK, page 429, that T. T. (*Kennington*) wishes to know if there is any office in which he could insure his tools. I know of no insurance office which undertakes this kind of risk, but if T. T. is not already sufficiently covered in cases of sickness, I would recommend him to join the Hearts of Oak Benefit Society, which, in addition to allowing 18s. per week in cases of sickness, and a correspondingly adequate sum in case of death, also provides its members against the loss of tools by fire to the extent of £15, beside other benefits, on payment of an average subscription of 10s. per quarter."

Insurance of Tools.—A. J. THRESHER (15, *Warwick Road, Stoke Newington*) writes:—"In reference to the query of T. T. (*Kennington*) in No. 27 of WORK, page 429, I do not know whether he or yourselves may be aware that by joining the Hearts of Oak Benefit Society of 17, Charlotte Street, Fitzroy Square, W., he can have his tools insured up to £20. The payment to the Society is 10s. per quarter, but in addition to the insurance of tools this includes benefits as follows:—£20 on death of member, £10 on death of wife, 18s. per week during sickness, 4s. per week superannuation, and other minor advantages. On application to the above address, however, full particulars will be sent."

Paint on Leather.—R. S. W. (*Norwich*) writes in reply to J. B. S. (*Nottingham*) (see page 318):—"You want to know how to prepare bag or portmanteau to receive paint so as not to crumble or fall off. This is the preparation: Thoroughly clean the leather with good spirits of turpentine. Then, when dry, give it three good coats of best japan black, the last one to have a small quantity of vegetable black in it to take the browny hue off it. He will find it will last a long time. I am in the trade."

Child's Wooden Toys.—P. P. (*Withington*) writes in reply to W. A. (*Hanley*) (see page 270):—"If he applies to E. May, Buckledge Avenue, Harlesden, London, N.W., for his catalogue, he will get what he requires."

Tool Wanted.—MEDICAL (*Cambridge*) writes in reply to GAUGE POINT (*Paris*) (see page 446):—"For a reliable rule to measure promptly and accurately (to $\frac{1}{16}$ in.) openings and spaces from 2 ft. to 10 ft., I have one which I made a couple of years back, and which has worked satisfactorily, and which I think may possibly be useful to G. P. The rule consists of a scale 1 ft. long graduated to $\frac{1}{8}$ in. and having a sliding bar working along it, after the manner of a cobbler's measure. This sliding piece corresponds accurately with foot-rule when closed, and has a mark $\frac{1}{16}$ from its end which will, of course, fall half way between first and second mark on fixed scale. Suppose, when rule is extended to fit space, the end of sliding bar fall between 6 in. and 6$\frac{1}{8}$ in. marks, then $\frac{1}{16}$ mark on bar will show by its position in regard to 6$\frac{1}{4}$ in. mark on rule whether 6$\frac{1}{32}$, 6$\frac{1}{16}$, or 6$\frac{3}{32}$ would be the most accurate reading. To the end of my scale are hinged a number of folding rods, as used in ordinary rules, so that any length from 12$\frac{1}{16}$ in. to 6 ft. (the extreme length of my rule) may be accurately read. I think GAUGE POINT will be able to adapt this idea to his requirements, but if it is useless to him let him believe that it has been very far from useless to the amateur who tenders it to him."

Trade Notes and Memoranda.

MESSRS. KRUPP have shipped a cast steel gun, weighing 235 tons, from Hamburg for Cronstadt. The calibre of the gun is 13¼ in., the barrel is 40 ft. in length, its greatest diameter being 6½ ft. The range of the gun is over eleven miles, and it will fire two shots per minute, each shot costing between £250 and £300. The gun is the largest in existence, and the heaviest yet exported by Messrs. Krupp.

THE large weigh beam in the engine house at Lee Mill, Bacup, belonging to Mr. Henry Maden, suddenly snapped asunder recently, and in a few seconds the massive beam engine, two galleries, and the large window were a complete wreck. The damage is estimated at over £1,000.

SIR EDWARD WATKIN has submitted a proposal for a gigantic railway project to the Secretary of State for India. It is nothing less than a railway from London direct to India *viâ* Kurrachee. The Channel Tunnel is a portion of the scheme, though not an absolutely essential part of it, since the start could be made from Calais or Boulogne. The railway would proceed direct to Gibraltar, using the existing lines as far as possible, and there would be introduced a novel feature in the line. This would be a vast broad-beamed boat capable of taking on board the entire railway train, as it arrives at Gibraltar, and delivering it on the rails at Tangiers. Here the line would strike eastward, keeping along the north coast of Africa, touching at Egypt, and proceeding by the Persian Gulf to Kurrachee, where it would join the Indian railway system. Sir Edward Watkin's project is said to have engaged the attention of several eminent engineers and capitalists.

A DUST-PROOF engine has been designed by Messrs. Hanson, Carter & Co., of Quebec Works, Bradford, for use in dusty situations as stokeholds, foundries, and the like. The engine is entirely enclosed, access to the working parts being through a door provided with a felt edging to render the closure air tight. They are made in three sizes, with 3 in., 4½ in., and 5 in. cylinders.

THE Worshipful Company of Armourers and Brasiers will hold at their Hall in the City of London in May, 1890, an exhibition of specimens of modern armour (including helmets, breastplates, and blades) and of original art works and designs in brass, bronze, copper, etc., to be the work of British subjects, and manufactured since 1st March, 1889. Prizes, certificates, etc., will be awarded for meritorious work, special prominence being given to exhibits by craftsmen. Full particulars may be obtained on application in writing to Marshall Pontifex, clerk, Armourers Hall, 81, Coleman Street, London, E.C.

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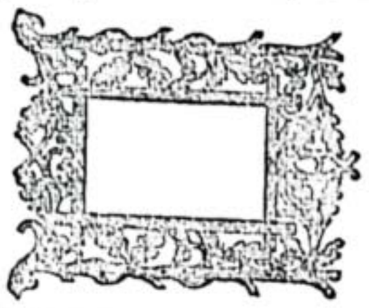

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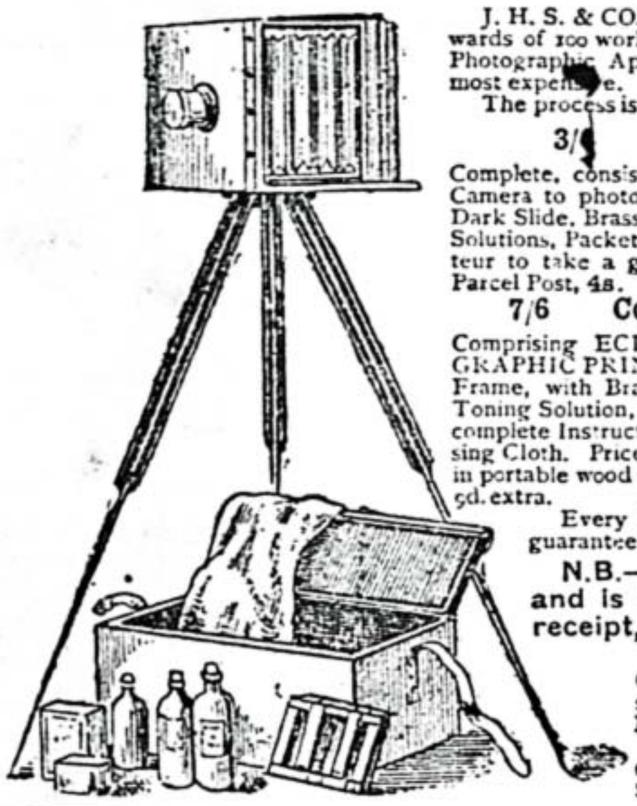

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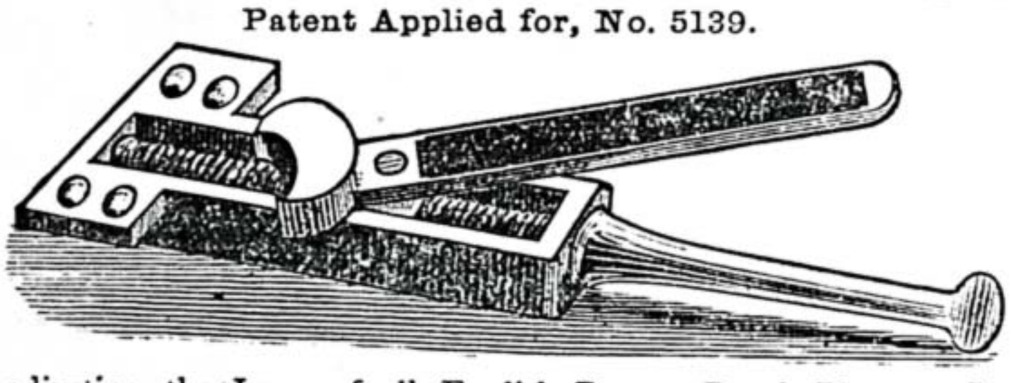

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